CEREAL SCIENCE *today*

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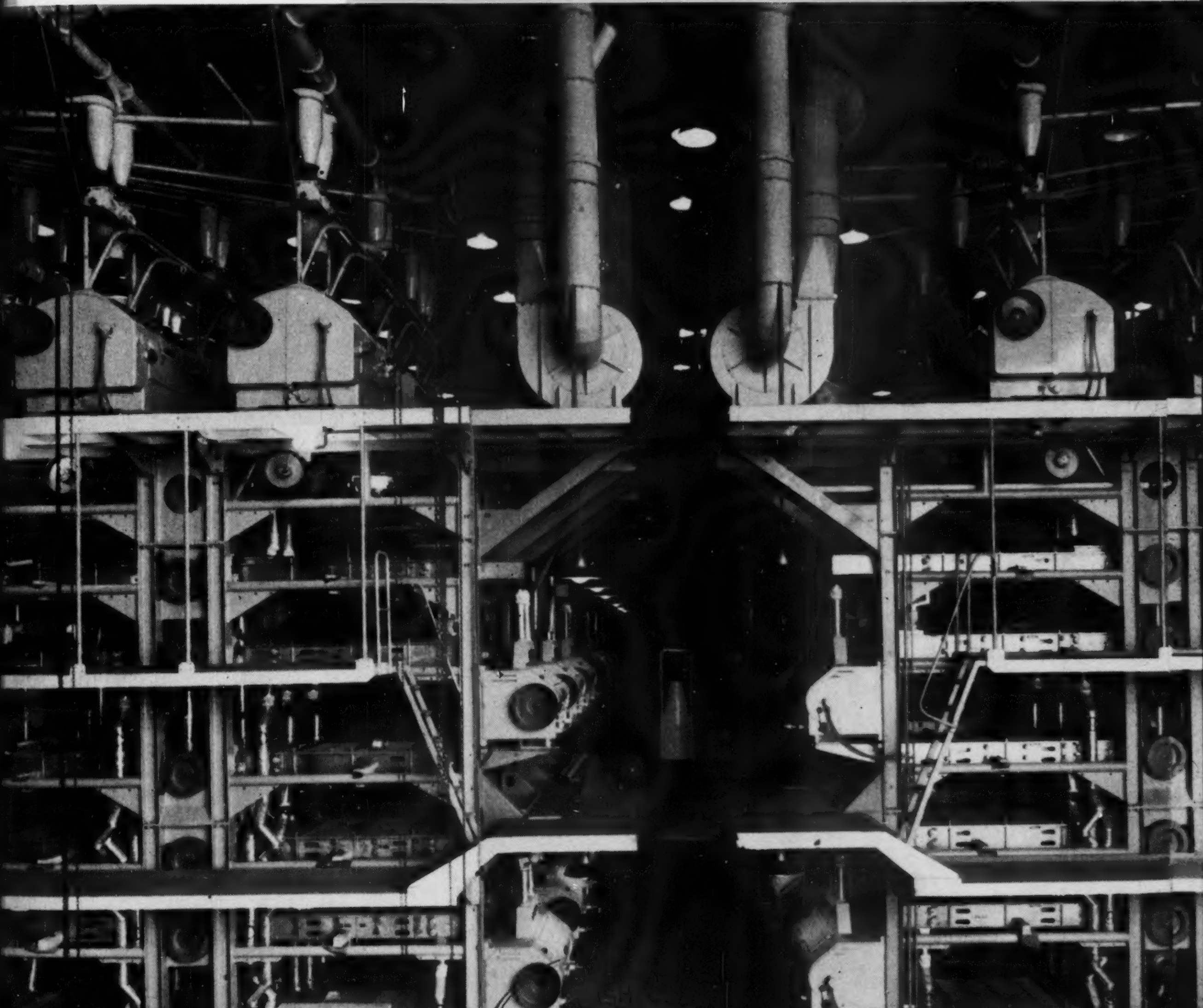


AN OFFICIAL PUBLICATION
OF THE
AMERICAN ASSOCIATION
OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

HIGHLIGHTS OF FLEISCHMANN'S SERVICES TO BAKERS: THEN AND NOW One of a Series

the Baker's Primer

1905 . . . the first edition inaugurated a new service

IN 1905, Fleischmann again demonstrated its interest in the baking industry. That was the year Fleischmann introduced, in both German and English, the *Treatise on Baking*. Based on a wealth of Fleischmann production experience and Fleischmann technical know-how, the book was the first such published in America. Hundreds of thousands of copies of this "baker's primer" have been distributed since then, and its revised editions are still being used by bakers all over the country. In a sense, then, *Treatise on Baking* inaugurated our Technical Service Department.

Today, technical service still plays a vital role at Fleischmann's. Our technical men handle thousands of inquiries a year. Fleischmann's is only too glad to help, and we work by this credo: "We've either got the answer, or we'll show you where to get it."

Whether the query concerns a new formula (our formula file is one of the largest), a water problem, a labeling difficulty, a more efficient plant set-up or a new production process, it is to Fleischmann that bakers turn. It's been that way for 91 years now, and *we intend to continue the service as long as there's a baker who needs it!*

Fleischmann's Yeast

MEASURE YOUR YEAST BY THE SERVICE YOU GET

The Roche Review Of Enrichment Requirements

for Cereal Grain Foods in the United States

All figures represent milligrams per pound

PRODUCT	Thiamine (B_1) Min.	Thiamine (B_1) Max.	Riboflavin (B_2) Min.	Riboflavin (B_2) Max.	Niacin Min.	Niacin Max.	Iron Min.	Iron Max.
Enriched BREAD or other *baked* products	1.1	1.8	0.7	1.6	10.0	15.0	8.0	12.5
Enriched FLOUR[1]	2.0	2.5	1.2	1.5	16.0	20.0	13.0	16.5
Enriched FARINA	2.0	2.5	1.2	1.5	16.0	20.0	13.0	*
Enriched MACARONI & NOODLE Products[2]	4.0	5.0	1.7	2.2	27.0	34.0	13.0	16.5
Enriched CORN MEALS	2.0	3.0	1.2	1.8	16.0	24.0	13.0	26.0
Enriched CORN GRITS[3]	2.0	3.0	1.2	1.8	16.0	24.0	13.0	26.0
Enriched Milled WHITE RICE[4]	2.0	4.0	1.2**	2.4**	16.0	32.0	13.0	26.0

* No maximum level established.

** The requirement for vitamin B_2 is optional pending further study and public hearings because of certain technical difficulties encountered in the application of this vitamin.

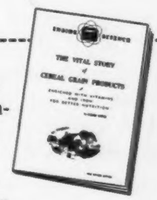
1 In enriched self-rising flour, calcium is also required between limits of 500-1500 mg. per pound.

2 Levels allow for 30-50% losses in kitchen procedure.

3 Levels must not fall below 85% of minimum figures after a specific test described in the Federal Standards of Identity.

4 The Standards state that the rice, after a rinsing test, must contain at least 85% of the minimum vitamin levels. The Governments of Puerto Rico and the Philippines also require this rinsing test. If the method of enrichment does not permit this rinsing requirement to be met, consumer size packages must bear the statement, "Do not rinse before or drain after cooking." Rice enriched by the Roche method will meet the rinsing test. The South Carolina law does not require a rinsing test on packages less than 50 pounds, as the rice in small packages is presumed to be sufficiently clean.

The maximum and minimum levels shown above for enriched bread, enriched flour, enriched farina, enriched macaroni, spaghetti and noodle products, enriched corn meal and corn grits and enriched rice are in accordance with Federal Standards of Identity or State laws. Act No. 183 of the Government of Puerto Rico requires the use of enriched flour for all products made wholly or in part of flour, including crackers, etc.



Brief, authoritative stories about the enrichment of many cereal grains have been gathered into a booklet which you may have for the asking. Just send your request for "The Vital Story of Cereal Grain Products" to the Department of Education, Fine Chemicals Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey.

Roche®

American Association of Cereal Chemists

PURPOSE OF THE ORGANIZATION

The American Association of Cereal Chemists is devoted to: 1) the encouragement of scientific and technical research on cereal grains and their products; 2) the study of development and standardization of analytical methods used in cereal chemistry; 3) the promotion of the spirit of scientific cooperation among all workers in the field of cereal chemistry; 4) the maintenance of high professional standards of its membership; and 5) the encouragement of a general recognition of the value of the chemist and biologist to the cereal industries.

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MEMBERSHIP

Membership in the AACC is open to professionally qualified individuals anywhere in the world. An application form for membership may be obtained by writing the American Association of Cereal Chemists, 1955 University Avenue, St. Paul 4, Minnesota.

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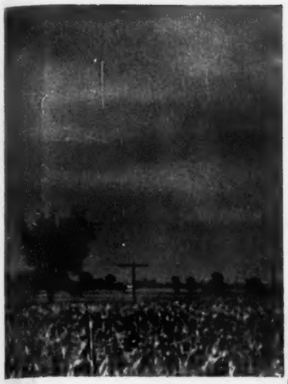

CEREAL SCIENCE *today*

FEATURES

DEPARTMENTS

STAFF

COVER: Bellera Mill (inside view). No previous flour mill ever looked like this. This Bellera scene shows compact equipment "stacked" for simple, efficient step-by-step operation in breaking down and processing wheat into flour. This compact equipment and process introduced by General Mills requires much less space than conventional equipment. It cuts the "miles" of handling and multitude of steps formerly required in milling. (See story on page 217)

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Editorial

SOME CHEMISTS ENGAGED in cereal work and eligible for membership in the American Association of Cereal Chemists are not now members. A Membership Recruitment Committee has been appointed to acquaint these chemists with the advantages of membership and to remind members of the advantages of a growing organization.

New interests and activities have evolved in the AACC's 45 years of existence. Unchanged is its basic organization as an association of individuals possessing certain qualifications of education and experience and having the common purpose of "1) the encouragement of scientific and technical research on cereal grains and their products; 2) the study of development and standardization of analytical methods used in cereal chemistry; 3) the promotion of the spirit of scientific cooperation among all workers in the field of cereal chemistry; 4) the maintenance of high professional standards of its membership; and 5) the encouragement of a general recognition of the value of the chemist and biologist to the cereal industries."

Corporate members, advertisers, and nonmember subscribers contribute to the financial support of the AACC, but the privileges of voting, holding office, participating in certain activities, and determining Association policies all belong exclusively to the individual active members.

Perhaps many eligible potential members require only an invitation from a member friend, any of whom can provide and endorse a membership application. Beginning September 1, the Membership Recruitment Committee offers a special inducement. Upon that date, a person may apply for membership beginning January 1, 1961, and start receiving the AACC journals immediately upon approval of his application with no additional charge.

PAUL E. RAMSTAD

THE USE OF CONDITIONING AGENTS TO IMPROVE

The Handling Properties of Cereal Products

By R. R. Irani and C. F. Callis, Research Department, Inorganic Chemicals Division, Monsanto Chemical Co., St. Louis 66, Mo.

IN THE BULK handling of cereal products, serious problems and inconveniences arise due to poor flowability and/or caking of the materials. The volumetric handling and mixing of dry powders necessitate an uninterrupted constant weight rate of delivery of the various components, and this restriction is only met by free-flowing materials.

There are two approaches to improving the handling properties of materials. The first is to change pertinent chemical and physical properties of the materials, if possible. The second approach, which is to be discussed in this article, is to admix a few percent of a finely divided powder called a conditioning agent. Obviously, prior to the use of a conditioning agent in cereal products, the FDA must be satisfied that the additive is harmless.

The conditioning phenomenon can be divided into two independent categories, namely, flow conditioning and cake inhibition. These two categories differ from one another in that the latter is much more sensitive to moisture and is usually encountered with materials that are fairly soluble in water, e.g., sugar, but not flour.

In this study, no attempt has been made to include all possible material-conditioner combinations. Rather, several materials commonly encountered in the cereal industry are considered.

Materials and Methods

Materials. All of the investigated materials were unconditioned, proprietary brand products obtained from various manufacturers. The 100-micron glass beads used in the flow test were obtained from Minnesota Mining and Manufacturing Co.

The calcium silicate hydrate, magnesium carbonate, and corn starch were proprietary brand, conditioner grade materials. The tricalcium phosphate and the Santocel® C, finely divided silica, were commercial conditioner grade products.

Table I shows particle size distributions and Table II some properties of the materials used in this work.

Flow Test. In most cases, when powders are mixed with very coarse, free-flowing materials, the mixture exhibits better flow than the original powder (8). This effect was used as a basis for the flow test described below.

Table II. Properties of Materials Studied

Materials to Be Conditioned	*Bulk Density*		*Weight Loss at 110°C.*
	Loose	*Packed*	
	lb/cu ft	*lb/cu ft*	*%*
Barley malt flour	32.1	43.8	7.88
Bread flour	32.1	50.2	8.15
Cake flour	27.3	43.8	8.10
Anh. monocalcium phosphate	56.0	62.1	0.3
Sodium bicarbonate	53.7	74.2	36.6
Powdered salt	37.2	67.5	0.04
Granulated sugar	52.0	52.5	0.02
Powdered sugar	51.3	58.1	0.05
Cocoa	15.5	39.5	7.2
Nonfat powdered milk	29.0	45.0	8.0

Table I. Particle Size Distribution of Materials and Conditioners

Materials to Be Conditioned	*Weight Percent Frequency for Micron Size of*										*Geometric Weight Means Size*
	0–2	*2–4*	*4–6*	*6–10*	*10–20*	*20–40*	*40–60*	*60–80*	*80–100*	*Over 100*	*μ*
Barley malt flour	..	..	..	..	5	29	28	20	11	7	49
Bread flour	..	..	..	..	5	35	30	16	8	6	47
Cake flour	.	..	..	..	20	50	19	7	3	1	29
Anh. monocalcium phosphate	..	..	..	2	18	50	21	6	2	1	30
Sodium bicarbonate	..	..	..	..	2	14	20	24	14	15	70
Powdered salt	..	..	..	..	0	5	11	13	13	58	110
Granulated sugar	..	..	..	..	..	..	..	..	..	100	580
Powdered sugar	..	..	..	..	0.3	10	25	24	17	23.7	71
Cocoa	..	..	2.5	12.5	43	35	6	1	..	..	18
Notfat powdered milk	..	..	0.5	1.5	8	19	17	12	10	32	68
CONDITIONERS											
Tricalcium phosphate	20	50	21	8	1	..	..	..	..	..	3.0
Basic magnesium carbonate	11	38	21	23	7	..	..	..	..	..	4.0
Santocel® C[a]	50	42	6	2	..	..	..	..	..	..	2.0

[a] 93% SiO_2.

Two funnels were set up, one directly above the other on a ring stand, with the tip of the orifice of the top funnel one inch above the plane of the top opening of the lower funnel. These were 60° powder funnels with a 4-inch maximum diameter on the cone and having an outlet tube ⅝ inch in diameter and ¾ inch long. The lower end of the stem of the lower funnel was stoppered.

Fifty to one hundred grams of the sample (depending on the bulkiness) were gently poured into the top funnel; this permitted the sample to disperse and settle into the lower funnel. After three minutes' allowance for the trapped air to escape from the powder bed, the cork was removed without gross disturbance of the sample. If the sample completely flowed out of the funnel, it was classified as free-flowing. Such samples were quantitatively compared by measuring the delivery rate in weight per unit time. If the sample did not completely flow out of the funnel, the minimum weight percent of 100-micron glass beads necessary to render the mixture free-flowing was determined. This was systematically done in each case; the 1:1 mixture was tested first.

Qualitative observations, as well as measurements of angle of repose and difficulty of flow through various sized orifices, agree with the conclusion that the more poorly the powder flows, the more glass beads are necessary in the test.

Accelerated Caking Test. Twenty grams of the lump-free sample were spread evenly in a Petri dish 1½ inches deep and 3 inches in diameter. The dish was placed in a humidity chamber Model No. VP-400, manufactured by Blue M Electric Co., Blue Island, Illinois, which controlled the temperature to ± 0.5° C. and the relative humidity to ± 2% absolute.

The sample was left in the humidity chamber for times varying between hours and weeks, depending on the hygroscopicity of the sample. Insufficient moisture pickup formed no cake, whereas too much saturation caked all samples, conditioned and unconditioned, so that no relative differences could be shown.

After humidification, the sample was removed from the chamber and dried in a desiccator over calcium chloride until no further change in weight occurred. This usually took 12 hours. The dried sample was carefully transferred onto a 10-mesh screen that would normally let all of the original sample pass through. The screen was then shaken to separate the uncaked material. The two fractions were weighed, and the percent caked (left on the screen) was then calculated.

Bulk Density Determination. The loose-bulk density was measured by weighing 100 g. of the sample and gently pouring it into a 250-ml. graduate through a funnel, to assure reproducible packing. The bulk density in lb. per cu. ft. was computed by dividing the final volume in cc. into 6240.

The packed-bulk density was determined in a similar way to that described above, except that the graduate was tapped until no further decrease in volume was observed upon further tapping.

Particle Size Distribution. The particle size distributions of the materials and conditioners were measured by either sieving, micromesh sieving (4), sedimentation (1), centrifugal sedimentation (6, 10), or microscopic electronic counting and sizing (1), as previously described. The choice of the particular method depended on the size range of the specific powder (3).

Ease of Blending. Fifty grams each of sulfur and salt were introduced into two shells of a twin-shell dry blender. The shells were turned around a fixed number of revolutions, and the contents were then carefully and evenly spread on a piece of paper. One-gram samples each were taken from the center of the pile and the two ends. Each sample was slurried in distilled water with a magnetic stirrer to dissolve the salt, and the final volume was made to 100 ml. The solution was then filtered to remove the insoluble sulfur.

Ten milliliters of the filtrate were titrated with 0.1*M* silver nitrate using fluorescein as an indicator. The percent salt in the samples was then calculated.

When mixtures of conditioned sulfur and salt were studied, the same procedure was utilized because the conditioning agents are insoluble.

Results and Discussion

Flow Conditioning. A flow conditioner is generally defined as an additive that will aid a powder in maintaining a steady flow and/or increase its flow rate through an orifice located in the base of a container. For the particular powders investigated, the empirical tests described above were designed to measure quantitatively the flow of these powders, as defined.

Figure 1 illustrates the improvement in the flow properties of barley malt flour, bread flour, or cake flour upon adding up to 4% of either tricalcium phosphate, basic magnesium carbonate, or Santocel® C. Similar data are shown in Figs. 2 and 3 for the components of a leavening system and for cocoa, respectively. Figure 4 shows that the rate of flow of powdered sugar through an orifice increased upon addition of tricalcium phosphate.

Microscopic examinations (9) of conditioned materials have shown that particles are uniformly coated with conditioner. To perform effectively a conditioner must adhere to the surface of the material to be conditioned; otherwise, it will merely mix with it.

Figures 1–4 show that for each material-conditioner combination there exists an optimum conditioner level beyond which further addition of conditioner may either retard flow or not alter it significantly. Flowability at this level may be different for the different conditioners.

Since the particles of flow conditioners readily adhere to each other as evidenced by the poor flow of the conditioner by itself, it seems reasonable to explain the existence of an optimum concentration of a flow conditioner in terms of a "saturation" of the surface of the conditioned particles by the conditioner. Thus, after the point of saturation is reached, flocs of the conditioner particles will form and retard the over-all flow. The nonadhering particles of the conditioner will also contribute to the dustiness of the material since in general they are small in size.

Calculations from the size distribution data of tricalcium phos-

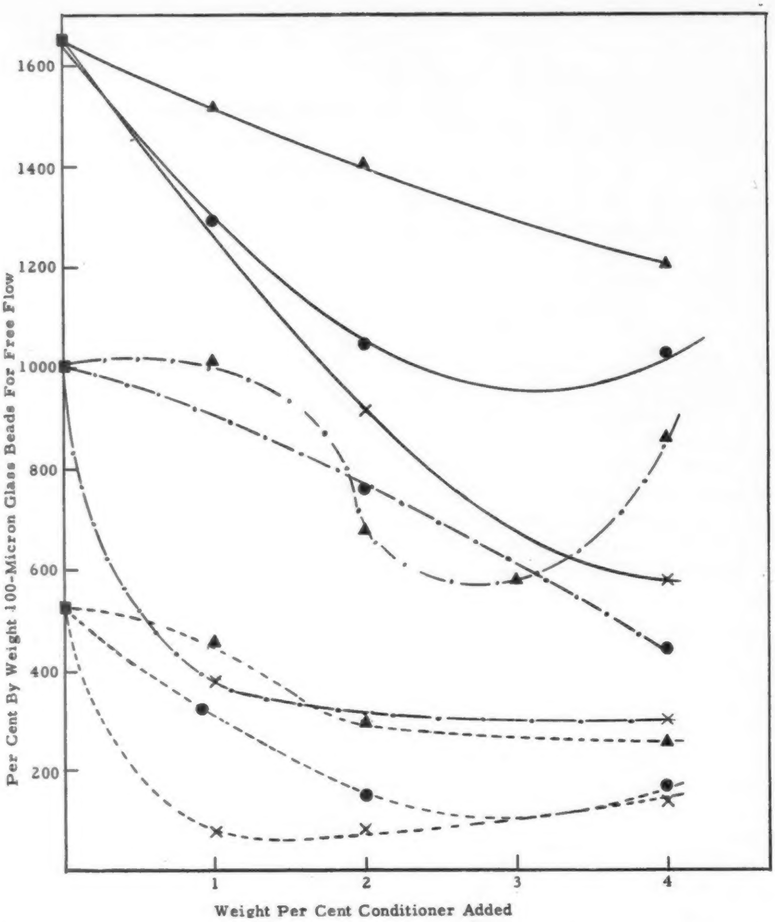


Fig. 1. Flow conditioning of flour. Legend: solid line, barley malt flour; long-short dash line, cake flour; short dash line, bread flour; circle, tricalcium phosphate; triangle, basic magnesium carbonate; X, Santocel® C.

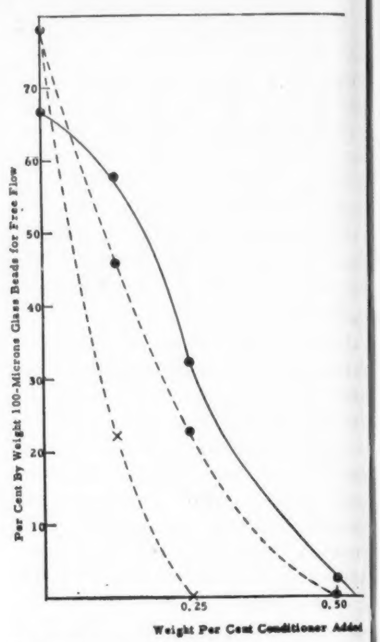


Fig. 2. Flow conditioning of leavening agents. Legend: solid line, anhydrous monocalcium phosphate; dash line, sodium bicarbonate; circle, tricalcium phosphate; X, Santocel® C.

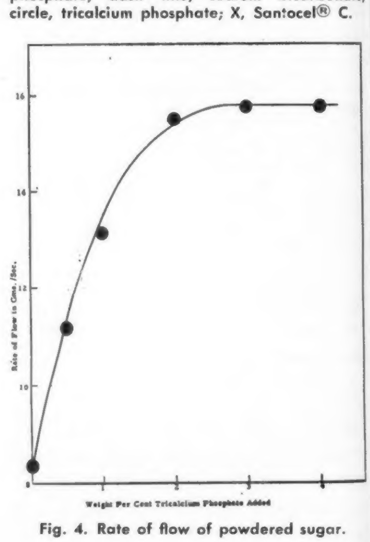


Fig. 4. Rate of flow of powdered sugar.

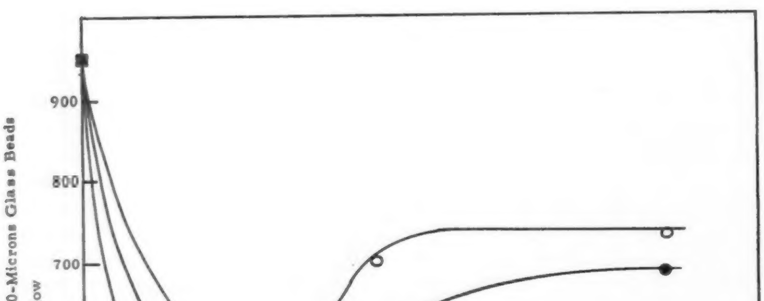


Fig. 3. Flow conditioning of cocoa. Legend: solid circle, tricalcium phospha'e; X, Santocel® C; open circle, calcium silicate hydrate.

phate and either barley malt or cake flour show that at the 3% level of addition there are, on the average, about 200 particles of tricalcium phosphate per flour particle. This number of particles would roughly cover 72% of the surface; at the 4% tricalcium phosphate level, the surface of the flour particles is essentially completely covered. These rough calculations are in fair agreement with the results presented in Fig. 1, where the conditioner saturation level is about 3–4%.

Figures 1 and 2 show that the conditioner with the highest de-

gree of subdivision is the most effective. Thus, a lesser amount of the more finely divided Santocel® C was required to improve flowability than of the other conditioning agents.

Adherence of the conditioning agent particles to the surface of the material being conditioned must alter their gross surface characteristics. Streaming potential measurements of the net surface charge have shown (5) that particles of the conditioner and material being conditioned interact frictionally.

Cake Inhibition. Table III illustrates the decrease in caking of salt, sugar, and powdered milk upon addition of 0.5–3% of a conditioning agent at 75% relative humidity and 27° C.

The mechanism of caking and its inhibition has been discussed previously (5). Essentially, the conditioning agents, sometimes referred to as coating agents, act as mechanical separators and cause the surface solution to extend over the whole particle, diminishing localized solidification between particles of the material.

Table III. Effect of Conditioners on Caking at 27°C.

Conditioner	*Weight Used*	*Caked*[a]
	%	%
SALT[b]		
None	..	100
Tricalcium phosphate	0.5	90
	1	75
	2	18
	3	0
Magnesium carbonate	0.5	58
	1	35
	2	10
	3	0
Santocel® C	0.5	15
	1	0
Calcium silicate hydrate	0.5	75
	1	68
	2	50
	3	30
SUGAR[c]		
None	..	100
Tricalcium phosphate	0.5	38
	1	19
	2	5
	3	0
Calcium silicate hydrate	1	80
	2	50
	3	5
Corn starch	0.5	100
	1	90
	2	85
	3	80
POWDERED MILK[d]		
None	..	65
Tricalcium phosphate	0.5	60
	1	58
	2	48
	3	34
Calcium silicate hydrate	0.5	95
	1	80
	2	52
	3	37
Santocel® C	0.5	35
	1	0

[a] Retained on 10-mesh sieve.
[b] 12 hours at 75% r.h.
[c] 36 hours at 75% r.h.
[d] 2 weeks at 75% r.h.

The particle size of both the material and the conditioner are important factors in caking. Hardesty and Kumargai (2) found that the finer a mixed fertilizer, the more severe the caking. Irani, Callis, and Liu (5), showed that the finer the conditioning agent, the more effectively it inhibits caking. Therefore, the higher the number of particles of a conditioner per particle of material, the higher its effectiveness.

Ease of Blending. A number of laboratory experiments have shown that conditioned powders are easier to blend together than unconditioned ones. The choice of the powders for this segregation study was mainly one dependent upon ease of testing for segregation.

When 1:1 mixtures of unconditioned and conditioned (2% tricalcium phosphate) sulfur and salt were blended, it was found that the conditioned samples formed a homogeneous mixture more easily. Table IV shows the results of analyses for sodium chloride on samples drawn from mixtures of sulfur and sodium chloride that had been blended for various periods.

If perfect mixing had taken place, then all samples drawn from the conditioned and unconditioned mixtures would give a sodium chloride analysis of 49 and 50% respectively. The average deviations from these values are also given in Table IV. Thus, for five revolutions the deviation from perfect mixing was ± 7.1 and ± 14.9% for conditioned and unconditioned samples, respectively. In addition, it took about 20 revolutions to mix unconditioned samples to a uniformity that required only 10 revolutions with the conditioned samples.

When the unconditioned sulfur and salt and tricalcium phosphate were added separately, the ease of blending was the same as that in the absence of the tricalcium phosphate. Thus, after five revolutions, the deviation from perfect mixing was 15.3%. This experiment indicates that the raw materials must be preconditioned if improved blending characteristics are desired.

Qualitative visual observations of conditioned vs. unconditioned mixtures of cocoa and sugar also showed that the conditioned mixtures were more uniform than the unconditioned ones.

Conditioning can be thought of as a dispersive phenomenon; and because of this, conditioned materials are easy to blend. Unconditioned materials are normally lumpy and therefore require either longer or more elaborate blending.

Table IV. Blending of Salt and Sulfur

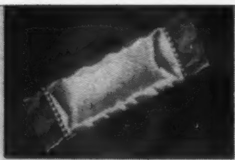
No. of Revolutions of Blender	*Salt Found*						*Deviation from Perfect Mixing*	
	Conditioned[a]			*Unconditioned*			*Conditioned*[a]	*Unconditioned*
		%			%		%	%
5	52.8	48.6	63.1	72.4	41.1	63.5	6.8	14.9
5	60.8	57.2	47.5		......		7.5	...
10	57.3	45.9	42.8	33.2	59.5	34.8	5.5	13.8
30	52.6	58.9	47.7	52.0	53.4	59.0	5.3	4.5
30	50.0	46.1	49.4	56.2	51.0	53.5	1.8	3.4

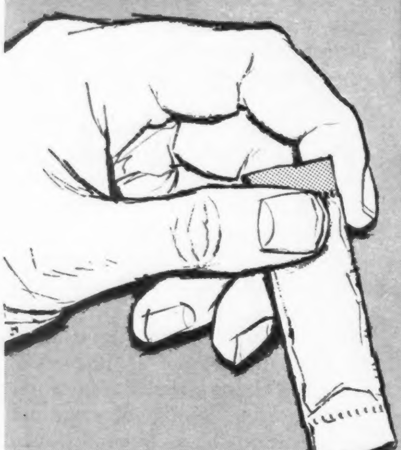
[a] 2% tricalcium phosphate added.

Criteria for Selecting a Conditioner

Price-Performance. The primary consideration in selecting a conditioner is whether it will give the desired or necessary improvement in either flow or caking properties. Beyond that, if the factors discussed below are unimportant, the cost is obviously the determining factor. The use of a conditioner is particularly attractive in those cases where the unit price of the conditioner is less than that of the material to be conditioned. For example, in conditioning cocoa, as shown in Fig. 3, 0.5% of either Santocel® C or tricalcium phosphate gives comparable performance. However, the use of tricalci-

(Please turn to page 214)





NEW FAVOR FOUND IN

Bulgor, an Ancient Wheat Food

W. L. Haley, Fisher Flouring Mills, Seattle, Wash., and J. W. Pence, Western Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture, Albany, Calif.

DINERS IN RESTAURANTS that feature Middle Eastern foods (notably Armenian) are often served a savory golden pilaf made from bulgor. In Syria, Lebanon, Egypt, Turkey, and other Middle Eastern countries bulgor has been a mainstay of diet for many centuries. Referred to as "Arisah" in the Old Testament, this ancient food is variously known as bulgur, bulgor, boulgur, boulghour, burgul, burghoul or something similar.

The ancient method of producing bulgor calls for boiling whole wheat in open vessels until tender. The cooked wheat is spread in thin layers to be dried by the sun. The coarse outer layers of bran are removed and the grain is cracked. Bran is often removed by sprinkling the dried wheat with water and rubbing the moistened grain by hand. Stone or a crude mill is used to crack the now vitreous kernels.

Bulgor is usually prepared after the wheat harvest. Each family may prepare its own supply or join with the others on a co-operative basis. Bulgor is stored in the home, often in large open earthenware jars. For serving, bulgor is simply heated with minimum water or steamed for 15 to 20 minutes. When prepared with a little oil, meat broths, or soup stocks and other flavorings, the dish is known as pilaf along the eastern Mediterranean and as pilau in Pakistan, to cite but two examples of differing names.

Not Really New in America

Although known to comparatively few people in this country bulgor has been produced commercially in the United States for many years. Two small companies in Fresno, California (Sunnyland Bulghur Co. and California Sun Dry Boulgour Co.) and another in Westboro, Massachusetts (The Wheatex Company), produce bulgor chiefly for local consumption.[1] Shipments are made, however, to parts of the country where citizens of Middle Eastern ancestry sustain a demand for the product and to some overseas markets. In 1951 delegates from the Oregon Wheat Commission, interested in developing wider use for white wheats, visited one of the plants in Fresno, Calif. Their study convinced them that effort should be made to expand the use of bulgor, both at home and abroad. During the next two years a co-operative project was launched at Women's Christian College, Madras, India, to determine the acceptability and keeping properties of the product in a humid, rice-eating country. Co-operation between the College, The Commission, and the Millers' National Federation demonstrated that with a minimum of instruction and education, an encouraging degree of acceptance could be developed.

Early in 1954 the Fisher Flouring Mills of Seattle, Washington, which had been carrying on research on this product for some time, volunteered to undertake commercial production on a substantial scale as part of a co-operative program to increase the export of U. S. wheat to the then food-short, rice-eating peoples of the Orient. The plan called for co-operative action between the Commodity Credit Corporation and the Fisher company, acting on behalf of the Millers' National Federation. Information gained from converting the traditional batch operations to large-scale continuous production is available from the Fisher Flouring Mills. A patent (2) on the process, assigned to the Fisher company, was granted in 1959. By the time contracts were signed and production neared, domestic interest and demand had become great enough for Fisher to undertake retail distribution in the United States.

Interest Grows Rapidly

During this period bulgor received publicity on the floor of the U. S. Senate. Senator Humphrey of Minnesota called attention to a report by Weiss (3) outlining the nutritional and economic advantages of converting a part of our wheat surplus into staple food acceptable for export into rice-eating areas. Traditionally, bulgor was regarded as being the nutritional equivalent of whole wheat but also more stable and resistant to attack by insects and vermin. The simple processing and low fuel requirements for preparation were additional advantages.

As a result of attention focused on this new-old wheat food, the Fisher company, in consultation with the Department of Agriculture's Western Utilization Research and Development Division, set out to develop modern processing methods. Early in 1955, a plant capable of producing 100,000 pounds daily was designed and successfully placed in operation

[1] Mention of firms and trade names does not imply recommendation by the U. S. Department of Agriculture.

by this company and distribution of the product into new areas was begun.

Early Results Disappointing

It soon became evident that a long-range program of consumer education would be necessary. Moreover, rice crops in the Orient had come back to normal, and the overseas peoples looked askance at this strange and foreign food product; nevertheless, active domestic and foreign promotion was continued undiminished by the new and the established domestic manufacturers, the Millers' National Federation, and the wheat commissions and grower organizations of wheat-producing states that have since followed Oregon's early example.

Present Outlook Bright

Slowly but steadily the domestic sale of bulgor has increased in the areas where it is offered for sale, and more companies are considering production of bulgor.

Overseas promotional efforts, aided by concessional export policies of the government, also are beginning to be successful. Large tonnages have been shipped to Korea—and also to Lebanon, in the very heartland of the bulgor-producing and -consuming countries. Extensive samplings have been made in many parts of the world. In some countries political restrictions have hampered development of markets. Such restrictions may ease suddenly or could become even more confining. Promotional efforts by producing companies and wheat grower organizations are being intensified, in part with the assistance of government. Offices for the promotion of U. S. wheat and wheat products, including bulgor, have been opened in several countries. Oregon, Washington, and Idaho have formed the Western Wheat Associates-USA, Inc., and Nebraska, Kansas, and Colorado the Great Plains Wheat Marketing Development Association. These organizations singly and together, never miss an opportunity to promote bulgor.

Modern Processing of Bulgor Studied

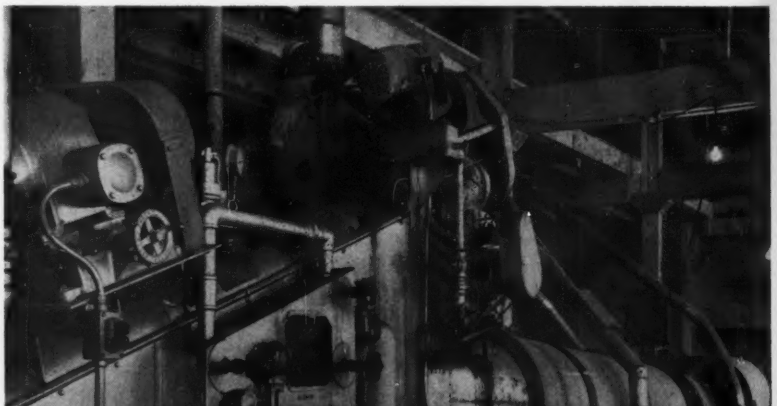
As practiced traditionally, the processing of bulgor is deceptively simple. Conversion of the elementary operations of cooking, drying, de-branning, cracking, and sieving to large-scale modern processing required extensive pilot plant study before the automatic, continuous processing operations now used (2) were successful. During this development, a study conducted by USDA's Western Utilization Research and Development Division (1) showed that acceptable bulgor could be produced over a considerable range and with several combinations of processing conditions.

The principal problem appears to be satisfactory introduction of sufficient moisture into the kernel so that complete gelatinization occurs during cooking. Cooking conditions must be selected to give complete gelatinization without darkening the product or making it so sticky as to interfere with subsequent drying. Conditions for the precook treatment and for the drying must be selected carefully to balance the costs of these treatments with the quality characteristics of the product. Successful drying of cooked wheat for bulgor is presently practiced in equipment varying from simple tunnel dryers to huge dryers of the type used for bulk grains. Cooking equipment varies from atmospheric batch kettles to continuous pressure cookers.

The design finally approved provided for the several necessary steps. White wheats are used, and uniform texture is desirable. Washing is essential because the wheat must be thoroughly cleaned and all broken kernels removed. This also provides the first tempering stage. After standing for about 4 hours, the wheat is moved through a battery of tanks with successive additions of warm water until at the end of 16 to 18 hours it is raised to 180°F. (82°C.) and approximately 40% moisture. Continuing to move, it passes into the pressure cooker where it remains 70 to 90 seconds under 30 pounds of pressure. This procedure insures complete gelatinization of starch without discoloration. As wheat leaves the cooker, it enters a large conveying drum with a counter-flow of heated air. This flash heat removes surface moisture and prevents sticking. Drying must be gradual at comparatively low temperature and preferably with continuous movement or frequent turning.

It is desirable to remove a small percentage of the rough outer bran. This is best accomplished by abrasion in some type of hulling or light grinding equipment immediately following a light spray of water. The wheat is then cracked to a desired granulation, and the

Fig. 1. Equipment used for modern production of bulgor. Inclined from the left is a continuous pressure cooker through which wheat at about 40% moisture passes in 70 to 90 seconds. The hot cooked wheat is delivered to the heated conveying drum in the background where drying begins.



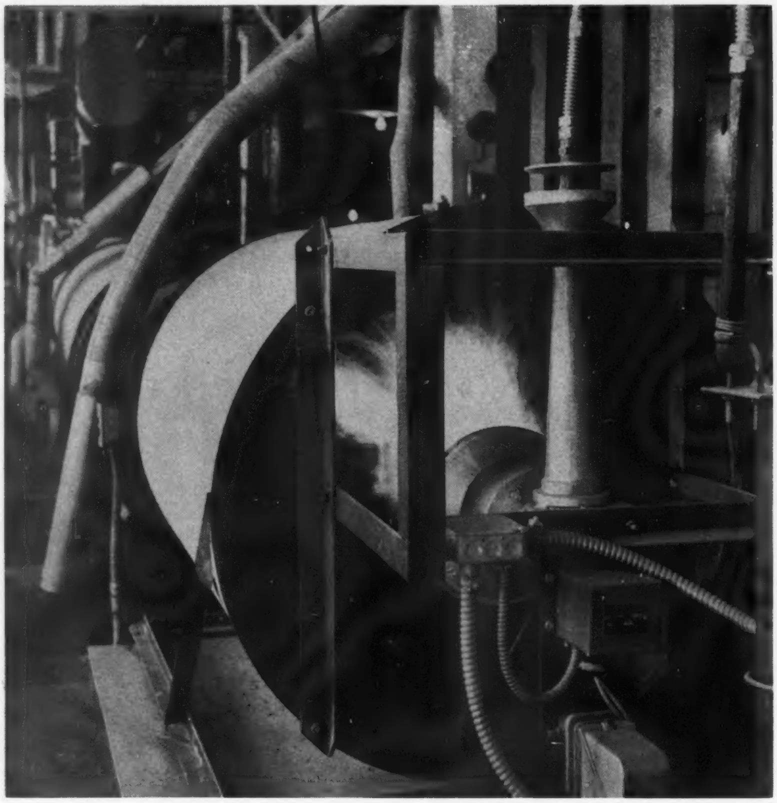


Fig. 2. Flash heat from a gas flame removes surface moisture from cooked wheat passing through the conveying drum and prevents sticking of the soft warm wheat during final drying stages.

process is complete.

Virtues of Bulgor Scrutinized Scientifically

To modern food processors, the claims made for the storage stability of bulgor seem extravagant, whereas those concerning its near-equivalence nutritionally to whole wheat seem quite reasonable.

The transfer of nutrients from bran and aleurone structures to endosperm during parboiling of cereals is well known. Opportunity for loss of nutrients during conditioning and initial cooking of wheat is not great, and bran removal from the dried, cooked wheat is only partial. A comparison of some of the nutrients in bulgor and in the type of wheat from which it was made is shown in Table I.

The differences in fat, fiber, and ash are significant but moderate. The values for these factors in the bulgor are sufficiently larger than those normally found in flour or wheat endosperm to indicate that a fairly large part of the bran nutrients is retained in bulgor. The finished bulgor contains about two-thirds as much thiamine, niacin, and phosphorus as the wheat. Iron and riboflavin are retained well, more than 80% of the amounts shown for wheat. Sun drying of bulgor, however, would be expected to cause lower values for riboflavin. The substantially higher amount of calcium in bulgor probably stems from the inward transfer of nutrients during parboiling and could be significantly influenced by the mineral composition of the water used for parboiling.

Nutritionally, the wheat products are somewhat superior to the other cereals shown in this table.

Thiamine losses, related to successive steps in processing, are reported in Table II. Washing is the only stage in which excess water is used and discarded. Moisture is increased to approximately 40% in three conditioning stages. During this time, 18 hours, the temperature is gradually raised to about 180° F. The wheat passes through the pressure cooker in 70 to 90 seconds and is then slowly dried at relatively low temperatures. Thiamine losses are surprisingly low. High readings for pearlings, which are mostly bran, and low values for endosperm fines, incident to cracking, appear to balance each other without greatly affecting the finished bulgor.

Table II. Loss in Thiamine Due to Processing[a]

Product	*Processing Stage*	*Thiamine*
		mg/lb
Wheat, soft white	To washer	2.08
Wheat	To conditioner	1.66
Wheat	From conditioner	1.63
Wheat	From cooker	1.50
Wheat	From dryer	1.56
Pearled wheat	From pearler	1.40
Pearlings	From pearler	2.92
Fines	From cracker	1.12
Bulgor — Ala	From packer	1.44

[a] Continuous process of Fisher Flouring Mills.

Two claims are generally made about the stability of bulgor—that it remains sweet and palatable for human consumption almost indefinitely and that it is highly resistant to attack by insects and microflora, particularly when compared to wheat itself. The persistence of these claims over the ages tends to lend credence, but full consider-

Table I. Composition and Nutrient Value of Bulgor and Various Cereal Grains Per 100 Grams

	Bulgor[a]	*White[b] Wheat*	*Milled[b] White Rice*	*Pearled[b] Barley*	*Whole Ground[b] Corn Meal*
Food energy, cal	362	335	362	349	355
Protein, g	8.5	8.4	7.6	8.2	9.2
Fat, g	1.2	2.0	0.3	1.0	3.9
Carbohydrate					
Total, g	78.2	76.4	79.4	78.8	73.7
Fiber, g	1.3	1.9	0.2	0.5	1.6
Ash, g	1.3	1.7	0.4	0.9	1.2
Calcium, mg	64	36	24	16	10
Phosphorus, mg	267	394	136	189	256
Iron, mg	2.8	3	0.8	2.0	2.4
Thiamine, mg	0.35	0.53	0.07	0.12	0.38
Riboflavin, mg	0.10	0.12	0.03	0.08	0.11
Niacin, mg	3.0	5.3	1.6	3.1	2.0

[a] Analyses by Fisher Flouring Mills.
[b] Data computed from Composition of Foods, USDA Agricultural Handbook No. 8, June 1950.

ation must be given to circumstances probably influencing the origin of the claims. An example is the custom of storing bulgor in open containers or porous bags.

Cereal technologists know well how rancid flavors and odors tend to diffuse away from products stored in porous containers and take full advantage of this fact in the distribution of certain cereal products. Another factor is that a low degree of off-flavor may come to be associated with the normal flavor of a product during lifetime usage, and it may never become discriminated against unless the off-flavor rises to fairly high proportions. Manner of preparation can also influence the degree of off-flavor at the time the product is eaten.

A recent critical appraisal of the storage properties of bulgor illustrates some of these points (1). Bulgor stored in cotton bags at 90° F. (32° C.) became definitely rancid in about 4 months but showed no definite rancidity after 9½ months at room temperature (70°–75°F.). When sealed in glass jars, nearly 6 months' storage at 90° F. was required for rancidity to appear, but the degree was eventually much greater than for product stored in bags. No difficulty was experienced in detection of rancid odors, but if rancid bulgor was prepared for serving by heating in water without the addition of oil or fat, the product could not be distinguished by taste from fresh bulgor prepared similarly. Oil or fat added early in culinary preparation trapped the products of rancidity, and the final product was unpalatable. So far as is known, rancidity, though unpleasant, has no serious effect on the nutritive value of bulgor.

The custom of drying bulgor in the sun undoubtedly hastens the onset of rancidity but also may decrease the total storage period required for disappearance of most of the offensive odors of fat oxidation. The combined effect of sun-drying, relatively high storage temperatures, and a moderate degree of acceptance of rancidity in bulgor could thus very easily lead to belief that bulgor is exceedingly stable in storage.

A probable principal reason for the apparent lack of trouble with insect and mold or bacterial infestation of bulgor is that it has been sterilized during cooking, dried to 10% or less in moisture, and subsequently stored under dry conditions not particularly suitable for reinfestation. The vitreous nature of the product may also be a factor. Harvested wheat on the other hand is often heavily laden with yeasts, molds, and bacteria, and may already be infested to some degree with insect pests or their eggs. Spoilage during subsequent storage can thus easily result, although experience is ample that clean, sound wheat stored properly can be kept in excellent condition for years. In cases of long storage under adverse conditions there appears to be no reason why bulgor should be expected to be resistant to damage by insects or microbial pests.

New Products Under Development

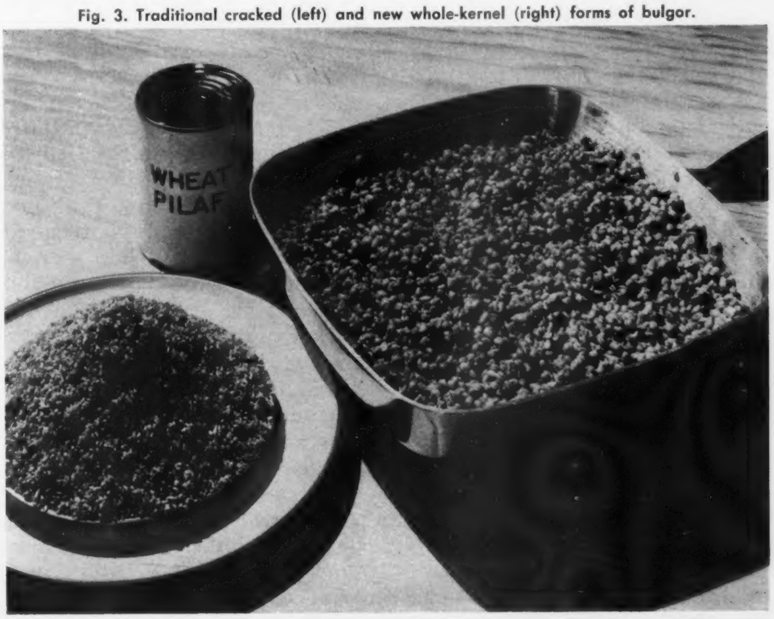
A canned, whole kernel bulgor and simple pilafs prepared from it have recently been developed by USDA's Western Utilization Research and Development Division to cater to today's convenience market. The product is prepared for serving within 3 to 5 minutes merely by heating the contents of the can with a few tablespoons of additional water. Preliminary acceptance trials have been very encouraging and several food companies have shown great interest in the product. The added cost, however, may be a limiting factor in export markets.

Processing of the whole-kernel product is much simpler than for the traditional cracked grain in that no drying, cracking, and sieving are required. Partial debranning is accomplished in conjunction with initial cleaning and washing in such a way as to remove only the outer bran coats. The "peeled" wheat is then heated in an excess of water until sufficient moisture is absorbed to permit complete gelatinization of the starch during subsequent retorting of the filled cans. Any seasonings needed to make a pilaf are mixed with the cooked wheat just before it is filled into cans and sealed under vacuum.

Dry heat expansion or other suitable means to open up the structure of conventional dry bulgor converts it into a quick-cooking or instant product with both domestic and export appeal. Both time and heat required for culinary preparation are reduced to a minimum. In chronically fuel-short countries this is especially important. After preliminary soaking in water, bulgor itself requires very little heat for preparation, but any reduction whatsoever in fuel requirements is a distinct advantage. Thus, instant bulgor may soon be available in the nation's food stores. It qualifies as an ideal basic survival ration in case of disaster.

(Please turn to page 214)

Fig. 3. Traditional cracked (left) and new whole-kernel (right) forms of bulgor.



LABORATORY AND COMMERCIAL STUDIES ON

Malt as an Adjunct in Cracker Baking

By Howard J. Wolfmeyer and Nison N. Hellman, Froedtert Malt Corporation, Milwaukee, Wisconsin

THE VALUE OF malt for improving baked products has been recognized since the early 1890's. Baker and Hulton (4) described the use of cereal malt for supplementing bread flours as "common" as of 1908. These authors, by their proposal of an enzyme theory of flour strength, probably were the first to recognize the significance of flour enzymes, both amylolytic and proteolytic, in baking. They postulated that the beneficial effect of a malt supplement was due to the action of the "starch-liquefying enzyme" provided by this means.

In a fundamental study of cracker baking performed in 1924, Johnson and Bailey (8) found that flours used in baking varied widely in diastatic activity. They attributed the failure of certain cracker sponges to rise properly in the trough to the low diastatic activity of the flour. They showed that during the initial 21 hours of fermentation the yeast utilized the sugar about as quickly as the enzyme produced it. Following the initial 21-hour period, however, diastatic activity continued, creating a sponge with a high maltose level because the yeast appeared to be inhibited by the low pH of the sponge (pH 3.80).

The history of the use of a malt adjunct in crackers is not clearly described in the literature. Its use in cracker baking appears to follow closely that in the baking of bread. In recent years, Bohn (5) and Pyler (10) have acknowledged the use of malt flours, malt extracts, and malt syrups in the manufacture of crackers. These malt products are used as 1) a source of diastase for the production of sugars from starch, 2) a nutritional aid for yeast, and 3) a sugar to enter into a browning reaction.

While malt and malt syrup can be made from a variety of cereals, barley is most generally used. In the production of malt, the grain of selected varieties of barley is first steeped in water to a predetermined moisture content and then permitted to germinate or sprout. During this process, the grain kernels begin to liberate amylolytic and proteolytic enzymes which act upon the starch and protein of the grain, resulting in partial conversion and modification. When germination has progressed to the desired degree, the so-called "green malt" is transferred to kilns and dried. During kilning, the moisture content is reduced from about 50% to less than 5%.

The dried malt, except for greater plumpness of the berries, closely resembles the initial barley in external appearance. The fibrous hull of the grain remains attached to the berry throughout malting and must be removed before malt can be used for diversified food applications. Traditionally, the hull has been removed by cooking the malt into a mash, filtering off the liquid extract, and concentrating the extract to a very thick syrup. In the mashing process by which the extract is prepared, malt enzymes further convert starch to maltose and dextrins, thus contributing to the desirable functional properties of malt. Such malt extracts, syrups, or hygroscopic dried powders derived from them have hitherto been the most widely used form in which malt adjuncts have been available to the food industry.

Recently an array of malts in nonhygroscopic flour form has been made available to the food industry. These products are made possible by modifications in the normal malting procedures so as to create additional conversion of the starch to maltose and dextrins. By further modification of the drying cycles, a range of malt flavors and colors has also been produced. The resulting special whole-berry malt products are milled by procedures analogous to those used in wheat or rye milling to yield malt flours which have all the advantageous characteristics useful for the baking industry. Their superiority to malt extracts lies in 1) greater stability of enzymatic activity, flavor, and color, 2) greater ease of handling, blending, weighing, and shipping, 3) greater enzymatic activities, and 4) wider available range of properties with exacting uniformity.

Although actual production of marketable crackers cannot take place on a laboratory scale, fundamentals of sponge and dough fermentations can be studied in the laboratory. Extensive studies relative to the use of refined malt flours in sponge and dough fermentations were made. These studies were conducted primarily to achieve an optimum blend of amylolytic and proteolytic values together with nutrient substances necessary to promote vigorous yeast fermentation without necessarily making any change in the times and temperatures previously employed in the various cracker bakeries. The results of laboratory studies of sponge fermentations, as well as the results of commercial

cracker baking trials are reported.

Methods and Materials

Gas production of laboratory sponges was measured by a modification of the standard *Cereal Laboratory Methods* (1). It was necessary to reduce the size of the sponge to 5 g. to facilitate use of the mercury manometer during a 20- to 22-hour period. To measure the gas production of sponges, 5 g. of soft wheat sponge flour (weighed on a 14% moisture basis) and 3.5 ml. or more of distilled water (depending upon the experiment) containing 0.15 g. (for a 3.0% level) or 0.015 g. (for a 0.3% level) of baker's yeast in suspension were placed in a Sandstedt-Blish pressure meter (11) and mixed with various levels of adjuncts to a normal consistency with a spatula. A mercury manometer was then secured tightly, and the apparatus was placed in a 30° C. water bath. Readings of the manometer were taken approximately every 30 minutes during a 20- or 22-hour period.

The pH of the sponge during the fermentation period was followed with another sample using the method described by Micka (9). For pH determinations, one part by weight of the sponge was mixed with two parts by weight of redistilled water. Three minutes were allowed for hydration and equalization of the hydrogen-ion concentration throughout the mixture. Determination of the pH was made with a Beckman model H2 pH meter. During this study, it was found that measurements made by placing the electrodes directly into the sponge for a more rapid determination correlated closely with measurements made in water-sponge suspensions.

The percentage levels of malt, yeast, sugar, and water are all based on the weight of the sponge flour. The levels of malt adjuncts varied from 0.25 to 2.0%, based on the weight of the flour. In the following experiments the malt adjuncts are referred to as malt syrup and flours A and B. Malt syrup is a commercial grade with a diastatic value of 80° Lintner and contains 48% maltose, 25% dextrins, 5.5% protein, 1.5% ash, and 20% water. General analysis of diverse malt flours shows them to consist of 11.5 to 15.0% protein, 1.5 to 2.5% fat, 2.0 to 3.0% ash, and 2.0% fiber. Malt flour A had gassing power of 180 and color of 1.6° Lovibond (2); malt flour B had gassing power of 90 and color of 15° Lovibond. Gassing power is defined as the increase in pressure caused over a 5-hour period in the standard gassing power test by the addition of 0.1% of the tested malt to a standard unmalted flour.

Laboratory Results

The course of gas production in sponges at 70% absorption and 30° C. and containing malt syrup or flour is shown in Fig. 1. The dry malt flour at half the concentration of malt syrup can promote an equal or greater fermentation in a cracker sponge. By selecting the appropriate malt flour and its concentration, the total gas production after 22 hours obtained from a malt flour containing sponge can be adjusted to equal that from a malt syrup containing sponge. In the practical baking case, such an adjustment of equivalence of syrup and flour could be effected by following the rise of the dough in the troughs. Characteristically, the malt syrup may cause slightly more gas production than malt flours in the period up to 3 hours. The difference is small, however, and is insignificant in terms of the long fermentation which a cracker sponge undergoes.

The course of pH change in sponges prepared parallel to those used in the gassing power test is shown in Table I. It is apparent that malt flours and malt syrup act in equivalent fashion in lowering sponge pH. Although the pH values of all test sponges after 20

Fig. 1. The course of gas production in flour-water sponges to which malt adjunct and 3% yeast were added.

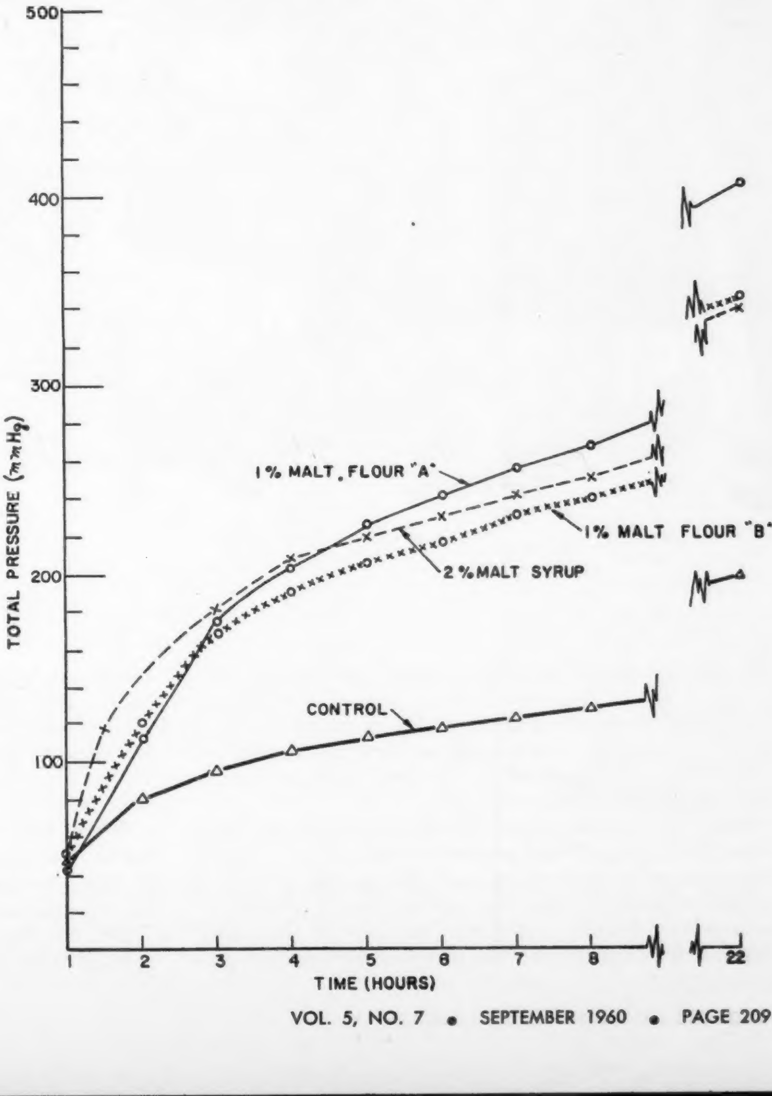


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Table I. Effect of Type of Malt Adjunct on Acid Development in Sponges

Time	pH				Drop in pH in Last Hour			
	2% Malt Syrup	1% Malt Flour A	1% Malt Flour B	Control, No Malt	2% Malt Syrup	1% Malt Flour A	1% Malt Flour B	Control, No Malt
hours								
1	5.55	5.60	5.60	5.55				
2	5.42	5.45	5.42	5.45	0.13	0.15	0.18	0.10
3	5.22	5.27	5.27	5.45	0.20	0.18	0.15	0.00
4	5.15	5.22	5.21	5.38	0.07	0.05	0.08	0.07
5	5.15	5.21	5.20	5.38	0.00	0.01	0.01	0.00
6	5.13	5.20	5.20	5.35	0.02	0.01	0.00	0.03
20	4.75	4.73	4.78	4.75	0.03	0.03	0.03	0.04

hours of fermentation are equal, the unmalted control sponge shows a marked lag initially in acid formation. The greater pH change of malted sponges is attributed to the stimulation of the sponge microorganic flora, yeast or other bacteria.

In some plants, dextrose is added to sponges and doughs as food for fermentation as well as a source of sugars to enter into browning reactions in the oven. In order to ascertain the effect of various levels of dextrose in combination with malt flour in a sponge, measurements of gas and acid development were made in laboratory sponges having such a combination. As shown in Table II, the

TABLE II. Effect of Dextrose in Conjunction with Malt on Acid Development (pH) in Cracker Sponges

Time	pH Units		
	0.5% Malt Flour A	0.5% Malt Flour A and 0.25% Dextrose	0.5% Malt Flour A and 0.5% Dextrose
hours			
0.5	5.60	5.55	5.60
1.0	5.55	5.55	5.55
2.0	5.40	5.35	5.35
3.0	5.18	5.15	5.10
4.0	5.12	5.12	5.10
20.0	4.70	4.70	4.68

addition of dextrose had little effect on acid production, and the small effect observed was restricted to the time of 1 to 4 hours. Gas production, however, as shown in Table III, was markedly increased throughout the course of fermentation. One per cent malt flour A more effectively increased gas production than 0.5% malt flour A combined with 0.5% dextrose. The proportion of the total gas evolved at equivalent periods, however, was approximately the same whether all malt or malt plus dextrose was employed. This was surprising, since it was anticipated that the readily available added dextrose would be quickly fermented and would contribute to elevated gas evolution initially. That this did not occur suggests that dextrose acted in a more complex manner, such as stimulating the bacterial population with consequent endogenous production of bacterial amylase in the sponge. If dextrose operates in sponges in such an indirect way, it certainly appears to be better practice to control the amylase level directly by adding malt and omitting dextrose.

Although most of the laboratory comparisons were conducted with a 3.0% level of baker's yeast, as required by standard methods using the Sandstedt-Blish pressure meter, it was felt that these data should be correlated with sponges prepared similarly to commercial cracker sponges. The tests were, therefore, repeated using a 0.3% level of baker's yeast in the sponges. Figure 2 shows that the rate of gas development in the initial period of fermentation is decreased with this lower level of baker's yeast. Comparison of Fig. 2 with Fig. 1 shows that the total gas produced in a 20-hour period is very much the same. The gas evolution after 20 hours at different yeast levels is very similar except that gas development with a 0.3% yeast level reaches a peak between 6 and 7 hours of fermentation; whereas, with a 3% level, the maximum is achieved within 2 hours. The relative effectiveness of the malts is the same at both levels of yeast addition. Table IV

Table IV. Effect of Types and Amounts of Malt Adjuncts on Acid Development (pH) in Cracker Sponges with 0.3% Yeast Level

Time	pH Units			
	Control	2% Malt Syrup	1% Malt Flour A	1% Malt Flour B
hours				
1	5.80	5.70	5.79	5.79
2	5.72	5.52	5.65	5.63
3	5.55	5.47	5.55	5.55
4	5.51	5.45	5.44	5.55
5	5.47	5.35	5.38	5.38
6	5.35	5.25	5.22	5.28
7	5.32	5.18	5.20	5.25
8	5.25	5.11	5.08	5.16
20	5.01	4.89	4.90	4.88

depicts the course of acid development in sponges with a 0.3% level of yeast. Although the type and amount of malt appeared to have little effect on total acid development or its rate, the yeast level did affect the rate of acid development. These tests showed that comparisons conducted on sponges with a 3% level of yeast can be anticipated to hold for cracker sponges having lesser levels of yeast.

The amount of water added to the sponges in these laboratory experiments was based on 70% absorption. For purposes of comparing the effects of various types and quantities of malts, the water level was held constant; however, the importance of water in fermentation is recognized. Crancer (7) has listed the functions of water in cracker sponges and doughs as follows: 1) to wet the flour, 2) to promote the workability of the sponge and dough, 3) to dissolve solid materials for tender and

Table III. Effect of Dextrose in Conjunction with Malt on Rate of Gas Development in Cracker Sponges

Elapsed Time	Total Gas Pressure							
	1% Malt Flour A		0.5% Malt Flour A		0.5% Malt Flour A 0.25% Dextrose		0.5% Malt Flour A 0.5% Dextrose	
hours	*mm Hg*	%[a]	*mm Hg*	%[a]	*mm Hg*	%[a]	*mm Hg*	%[a]
1	52	13.7	50	23.4	52	14.4	50	143
1½			84	39.2	84	23.0	84	24.1
2	112	29.6	110	51.6	120	33.0	116	33.0
3	170	44.8	148	69.0	178	48.9	170	48.9
4	192	50.6	158	74.1	202	55.6	190	54.6
20	380		214		364		348	

[a] Percent of 20-hour gas pressure.

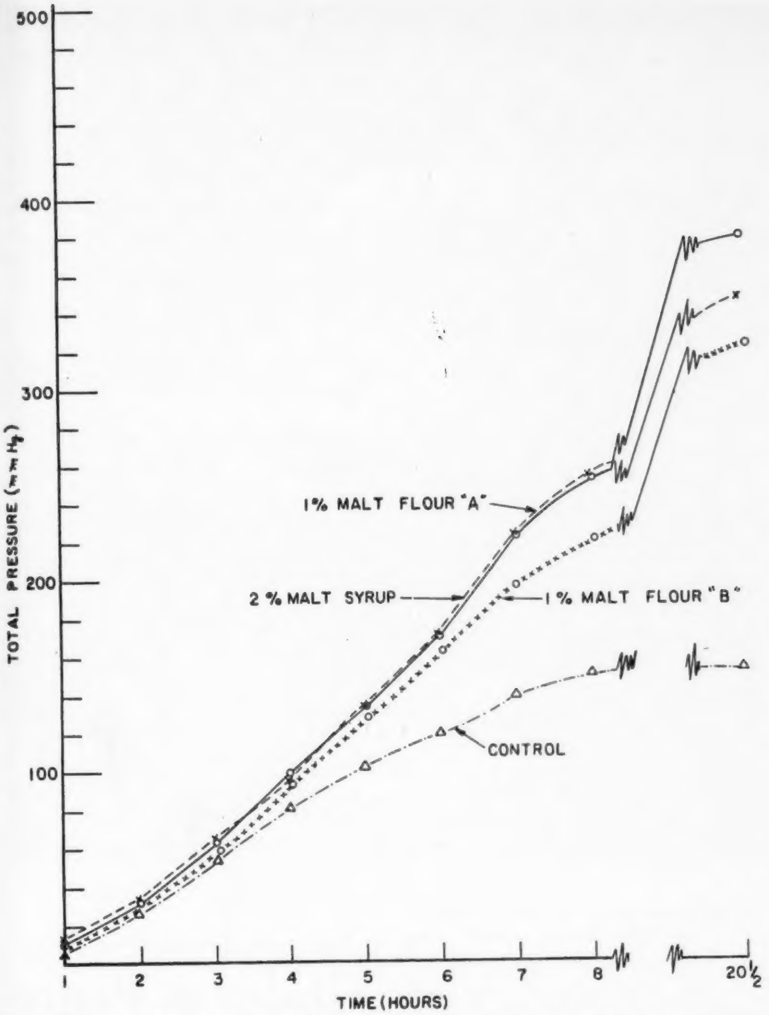

Fig. 2. The course of gas production in flour-water sponges to which malt adjunct and 0.3% yeast were added.

pleasing textures, and 4) to dissolve food substances required for yeast growth so nourishment may be diffused through the yeast cells for development of structure and flavor. Bohn and Favor (6) have shown that doughs with a higher water content generate more gas per hour than stiffer doughs. Table V illustrates a slight but significant difference between two sponges in the rate and total gas production resulting from a 2% increase in the absorption level. Because of this, attention should be given to the amount of water required when a dry malt is added instead of a syrup. The comparisons between the levels of malts in the preceding experiments were made on an as-is basis rather than a dry basis with no change made in the absorption level of the sponges. Table V illustrates that

Table V. Effect of 2% Increase in Absorption Level on Gas Development in Cracker Sponges

Time	*Rate*[a]	
	Sponge A	*Sponge B*[b]
hours		
1	7.0	10.0
2	11.0	14.0
3	12.5	12.5
4	15.0	13.5
5	16.0	16.0
6	20.0	20.0
7	21.0	22.0
8	15.0	15.0
8.5	12.0	15.0
20-hour total	465.0	480.0

[a] Pressure (mm.) per 0.5 hour in 5 g. sponge.
[b] 2% water increase.

additional water (even as little as 2%) will enhance sponge fermentation; the amount of water used has a significant effect on the amount of malt possibly required for a desired amount of fermentation.

Commercial Tests of Cracker Baking with Malt Flours

Because of the complexity of the cracker-baking process, it is necessary that laboratory results be substantiated by trials conducted in manufacturing plants. As suggested by laboratory experiments, cracker sponges prepared with a 2% level of malt syrup and a 1% level of malt flour A were compared under normal plant conditions. Although the laboratory data indicated that there should be little difference in the amount of rise of the sponge in the trough, it was found that the sponge made with malt flour A had a rise 4 inches shorter in the trough than the sponge made with malt syrup. The acidity of the sponges and the temperature of the sponges were identical after a 20-hour period. However, the laboratory data indicated that perhaps this rise resulted from the water level used in this commercial sponge. It was noticed during this first trial that the sponge made with malt flour A was stiffer than the sponge made with malt syrup. In the succeeding trial, the two sponges were repeated with 6% additional water added to the sponge containing malt flour A. The sponges now appeared to ferment identically. They both rose uniformly with the same rise and drop, acidity, and temperature. No difference in the final crackers baked from the sponge and dough using malt flour A or malt syrup was noticed. Both crackers appeared normal in every way.

For manufacturers who require less fermentation in their sponges and doughs, other malt flours such as malt flour B have proved satisfactory. Flours made from darker malts appear to have more flavor-precursor ingredients than malt flour A. In actual plant experiments, it was found that proper amounts of malt flours A or B added to the sponge carried through into the dough stage sufficiently for the production of a cracker with desirable bloom, that lay flat in the oven, and that did not buckle. This indicated that there was an ample supply of dough-modifying characteristics and sugars present to enter into a browning reaction for the development of bloom in the oven. It was also

found that with slightly elevated oven temperatures the baking time could be shortened without worry of scorching in band-type ovens.

Some manufacturers prefer not to add malt to their sponges but require it on the dough side for bloom development, flavor development, and desirable baking characteristics of the dough. It was found that the presence of malt flours A or B in the dough at half the level of malt syrup previously used caused the crackers to bake more quickly at slightly higher temperatures, to lie flat in the oven, and to have a desirable uniform bloom. In some instances it was found that the use of a malt flour even darker than malt flour B at a 1% level seemed to impart a gray color to the finished cracker. Although other ingredients may have influenced this effect, there is a possibility that the darker color of the malt flour contributed to the gray color. In this particular case use of malt flours A or B eliminated the problem. Results of taste panels show no significant difference in cracker flavors between those made with malt flours and those made with malt syrup. In Schaal oven tests, there are indications that crackers baked with malt flour have improved keeping quality. This correlates with the known antioxidant properties of malt flours (3).

Conclusions and Summary

This study has shown that the type and quantity of malt adjuncts have a major effect on the rate and quantity of gas production in cracker sponges but a lesser effect on the development of acid. The results of laboratory and commercial tests show that one part of enzymatic malt flour is equal to approximately two parts of malt syrup in promoting optimum fermentation and the baking of a desirable cracker.

It has also been shown that the amount of water used in the preparation of a sponge has a significant effect on fermentation. The level of yeast affects the rate of gas and acid development during the early period of fermentation but has no significant effect on the total gas production nor the final hydrogen-ion concentration. It has also been shown in both laboratory and commercial trials that the proper addition of malt flours to promote optimum sponge and dough fermentations facilitates the production of desirable crackers without the addition of dextrose.

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Irani & Callis

(Continued from page 201)

um phosphate would result in a saving of approximately $4.00 per ton of conditioned material whereas the use of Santocel® C would lead to an additional raw material cost of about $1.75 per ton of conditioned material, aside from mixing and handling costs.

Ease of Handling and Blending. One of the obvious expenses in using an additive is the blending cost and the resulting possible reduction in plant through-put. The adaptability of existing facilities is also important.

Effects on the Chemical and Physical Properties. Changes such as pH and turbidity of solutions, catalytic effects, color, odor, bulk density, dustiness, moisture retention, and hygroscopicity must all be evaluated. In general, these effects as well as the purity or assay of the product become less important as the amount of additive required diminishes. An example is the effect of a relatively insoluble conditioner on the turbidity of sugar solutions. Moss, Schilb, and Warning (7) have shown that at equivalent cake inhibition levels, starch and basic magnesium carbonate caused more turbidity than tricalcium phosphate.

Nutritional Value. This is a plus value for tricalcium phosphate when other factors are equivalent.

Adulteration of Foods. In conditioning food products, certain additives such as clays cannot be considered. In general, conditioners should not be used in foods without first satisfying the Food and Drug Administration that such conditioners are harmless as used.

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Haley & Pence

(Continued from page 207)

Bulgor, a Versatile Food

Bulgor is served most often, perhaps, as an accompaniment to meat dishes or with poultry. It is used in poultry stuffing or with roasts and broiled meats, especially lamb. Cooked bulgor incorporated into breads, rolls, or pancakes imparts a subtle flavor. It is often used in soups, sauces, and gravies or in meat loaf and hamburgers, and an array of casserole dishes is posssible with bulgor; certain types of salad make good use of it. It is used even for desserts such as Indian pudding, steamed puddings, or some types of custards.

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Try this texture trick

Pour ½ cup of plain, dry farina and a teaspoonful of salt into 3 cups of boiling water and cook until done. To another ½ cup of the same dry farina, add 3% of *Myverol® Distilled Monoglycerides, Type 18-07,* little white beads closely resembling the farina itself in appearance. (Write us for a free sample.) Pour *that* with its teaspoonful of salt into 3 cups of water, not boiling but at any temperature below 140 F. Then boil *that* until done.

Now set both pans aside for a few hours. Keep them both warm or let them both cool. It doesn't matter.

Come back and note which panful has turned into a jellylike mass and which still looks and behaves as it did at the moment the cooking was finished. See if you can taste a difference. (You can't.)

The difference is that the monoglyceride has complexed dissolved amylose and has thereby prevented gelation. The effect works with any starchy food.* We demonstrate with farina just because it photographs well!

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People, Products, Patter

• • • People

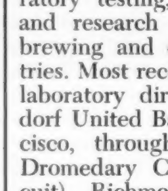
John Compton of John Labatt, Ltd., London, Ontario, appointed chairman of Technical Committee and Editorial Board, American Society of Brewing Chemists.

The death on April 27 of **Claude F. Davis,** AACC President 1940-1941, was noted in a brief item in the May issue from news received just before press time.

Mr. Davis was born in 1901 in Medford, Oklahoma, and was educated at Oklahoma A&M College, Stillwater, with B.S. in 1922, and at New York University. In 1925 he began his long and outstanding career in laboratory testing, quality control, and research with flour mills, brewing and other food industries. Most recently he had been laboratory director of Langendorf United Bakeries, San Francisco, through 1954, and the Dromedary Co. (National Biscuit), Richmond, Calif., 1955-1957; and Safeway Stores, Inc., Bakery Division, San Jose, Calif., until his death. He published many articles, in CEREAL CHEMISTRY and in several other journals in food technology.

Mr. Davis is survived by his wife and one married daughter.

Charles N. Frey receives Distinguished Alumni Award from Michigan State University; he is lecturer at MIT and Columbia, and director of scientific relations for Standard Brands.



Ralph C. Lakamp named director of Kroger Food Foundation, succeeding the late **George F. Garnatz.** Lakamp joined Kroger in 1945 and became head of the Foundation's cereal laboratory soon afterward. For the past year he has been chief of the general laboratory.

Matthew Hamell appointed project leader, General Foods Research Center. **John B. Holbrook** appointed associate director of manufacturing and engineering for General Foods Corporation. **Henry Schwartzberg** named project leader in engineering research area.

• • • Products

Stereomicroscope. A training microscope developed by Bausch & Lomb permits both instructor and trainee to examine a specimen at the same time. Components include two standard B&L StereoZoom microscopes, with accessories to facilitate dual use. Each microscope can be used independently. The dual unit is also used for advanced consultation, when a specimen is studied and discussed by two people simultaneously. Write to: Scientific Instrument Dept., Bausch & Lomb Inc., Rochester 2, N.Y.

• • •

Laboratory instruments. A new 60-page catalog of Sargent laboratory instruments is just out, illustrating and describing such well-known items as recorders and polarographs. Booklet 60. Write: E. H. Sargent & Co., Dept. 60, 4647 W. Foster Ave., Chicago 30, Ill.

• • •

Starch phosphates. Now in production in research quantities in a pilot plant, corn starch phosphates may be produced in commercial quantities by American Maize-Products Co. by the year-end. The company believes, on the basis of experiments already well along, that opportunities for waxy-corn and amylose-corn phosphates are very promising. The phosphates are bland in flavor and completely digestible, and have greater thickening power than the source starch. Their exceptional freeze-thaw stability solves a major problem: the curdling of sauces and gravies in frozen meat pies, Chinese foods, and others. Instant-type puddings are expected to benefit in quality by the phosphates. Potential uses in nonfood areas are in ore refining, pelletizing of low-grade iron ore (taconite), water treatment, and adhesives.

• • • Patter

Nutrition congress. Nutrition scientists from all over the world will participate in the Fifth International Congress on Nutrition to be held in Washington, D.C., September 1–7, 1960. An all-day symposium on "World food needs and food resources" will be one of the main features. The remainder of the program will consist of seven half-day panel discussions by invited participants, and special sessions of 10-minute papers. Headquarters hotels will be the Sheraton Park and Shoreham.

C. Glen King, Executive Director of The Nutrition Foundation and president of the Congress, will open the meetings on Sept. 1, with top U.S. Government officials as guests of honor. A day is specifically assigned for appraising world-wide situations, programs, plans, and new possibilities. The Congress will close with an all-day symposium on September 6, followed by an all-Congress banquet.

• • •

Nebraska Bakery Production Club's annual business session was held on June 27 at Hill Haven Farm south of Omaha. Officers elected to serve for the following year are Kurt Becker, president; Walter Kros, president-elect; Charles Wendelin and Tom Naughtin, vice-presidents; and Ed Rosse, secretary-treasurer. A social evening followed the session. Next meeting will be the annual picnic in September.

• • •

Offices moved. The executive offices of Henningsen Foods, Inc., were moved to the Lincoln Building, 60 East 42nd St., New York City, opening there on July 5. The new offices, with the extra space needed for the company's growth, overlook 42nd Street and Park Avenue from the 34th floor in the Lincoln Tower. Henningsens' friends are invited to "come up and see for yourselves."

• • •

Pillsbury enters nonfood field. Purchase by The Pillsbury Co. of The Tidy House Products Co., Shenandoah, Iowa, represents a venture into nonfood items: a noncaloric sweetener and a liquid starch; a bleach, detergents, and other household cleaning products. Management of Tidy House will remain unchanged, with its president, J. C. Rapp, becoming general man-

ager of the new Pillsbury division. A. W. Ramsey will be retained as marketing and product development consultant.

• • •

Merger for grain improvement. A boost for agricultural research and education is expected from the Crop Quality Council, a merger of the Rust Prevention Association and the Northwest Crop Improvement Association. The main purpose of the Council will be expansion of agricultural knowledge through research, pest control, and education for the benefit of consumers, producers, processors, and businesses serving agriculture. Objectives are the promotion of higher quality in production of crops, and better understanding toward the problems of the various groups involved in agriculture. Primary area of operation will be the commercial crop regions of the North Central States; headquarters will be in Minneapolis.

• • •

General Mills' new process. The recently announced General Mills Bellera "Air Spun" flour milling process, named for members of the Bell family who are and have been at the head of its operations, is receiving attention and comment.

The company emphasizes that the process is not limited to steps designed to improve the product after completion of actual milling, but is a basic development in the flour milling operation itself.

Direct, "streamlined" flow eliminates some elevations of stocks and cuts down the amount of handling and the number of steps required in the long-familiar way of milling. Compact classifiers with new features, in a "stacked" arrangement, replace sifters and purifiers.

A conventional mill with the same capacity as GM's new Bellera plant at Buffalo, N.Y., the company says, would require 28% more cubic feet of space.

"Air Spun" flour is expected to produce benefits for bakers and consumers, and to open the way to further development in the industry.

Key characteristics of the flour and the process, and their contributions, are announced by the company. The flour: excellent baking performance and uniformity, to match the needs of automated baking equipment and procedures. The process: simplicity; and flexibility, to help solve special problems of commercial baking.

It is also suggested that in crop years when the quality of grain is below normal, the miller will be in better position to produce top-quality flour.

Present daily capacities of Bellera mills: Buffalo, 14,000 cwt.; Minneapolis, 6,000 cwt. in bread flour mill; Des Moines, 6,000 cwt.

IMPORTANT NOTICE—46th ANNUAL MEETING

Members of the AACC wishing to present papers at the 46th Annual Meeting, April 9-13, 1961, in Dallas, should write immediately to the chairman of the session covering their field of interest.

The following sessions have been scheduled: *Insecticide Residues in Cereal Products,* Warren O. Edmonds, American Cyanamid Co., 3125 Gillham Plaza, Kansas City 9, Missouri; *Flavor Research,* Lazare Wiseblatt, American Institute of Baking, 400 E. Ontario St., Chicago 11, Illinois; *Chemistry and Technology of Feed,* Robert C. Wornick, Chas. Pfizer and Co., Inc., Ag Research Dept., Terre Haute, Indiana; *Chemistry and Technology of Yeast,* Gerald Reed, Red Star Yeast and Products Co., 325 N. 27th St., Milwaukee, Wisconsin; *Nutrition Aspects of Feeds,* Max L. Cooley, Hoffman-Taff, Inc., Box 1246 S.S. Station, Springfield, Missouri; *Continuous Breadmaking,* Oscar Skovholt, Quality Bakers of America, 120 W. 42nd St., New York 36, New York; *Starch Chemistry,* R. M. Sandstedt, Dept. Biochemistry and Nutrition, U. of Nebraska, Lincoln 3, Nebraska; *General Session,* Frank R. Schwain, Bulk Food Technical Services, Procter and Gamble Co., Winton Hill Tech. Center, Box 201, Cincinnati 24, Ohio; *Chemistry and Technology of Flour,* Kenneth Gilles, General Mills, Inc., 2010 E. Hennepin Ave., Minneapolis 13, Minnesota; *Useful Laboratory Techniques and Gadgets,* Lawrence L. Warren, Commander Larabee Milling Co., P.O. Box 356, Kansas City 41, Missouri; *Laboratory Layouts,* Grant W. Pearcy, The Pillsbury Company, 224 Second St., S.E., Minneapolis 14, Minnesota.

BYRON S. MILLER,
Program Chairman, Kansas State University, Manhattan, Kansas.
(Department of Flour and Feed Milling Industries)

THE LAST DATE FOR OFFERING PAPERS FOR PRESENTATION WILL BE DECEMBER 25, 1960

AACC LOCAL SECTIONS

Pacific Northwest Section's program for the 26th annual meeting, June 20 and 21, was included in the July issue, but more details, along with photographs, have arrived since. Speaking on "Lipids and lipoproteins in wheat flour," David F. Houston of the Western Utilization Research and Development Division, shown in the composite photo, reviewed the types of lipids found in wheat flour and discussed the quantities of each in the flour. New officers are in another photo.

The meeting was considered a very successful one. Next year's will be held in Portland, Oregon.

The annual bowling tournament was as usual won by the East team.

Over-all accuracy award winner, on all three tests, was N. D. Oleynick. Last year's accuracy winners for individual tests were Carl Gustafson, protein; J. W. Woodahl, moisture; and H. R. Fisher, ash.

Program participants in Pacific Northwest Section's annual meeting. June 20 and 21, 1960: Upper left, J. K. Krum, Sterwin Chemicals, Inc., speaking on "Food additives"; lower left, David F. Houston, Western Utilization Research and Development Division, USDA, Albany, Calif. — "Lipids and lipoproteins in wheat flour"; right, Doyle C. Udy, Section chairman, opening the program.

Pacific Northwest Section officers for 1960-61. L to R: Don Pitts, vice-chairman; Joe Shogan, chairman; Victor Evans, secretary-treasurer.

• • • •

Niagara Frontier Section's annual June picnic has been so popular that no details were changed this year from last year's, with the exception of some shifts in committee responsibilities. The date was the 25th, the main feature a chicken barbecue, and the place, the hospitable country home of Ann Collins' family, with swimming pool and other aids to a delightful outing. Members and their families again enjoyed a day of abundant fun and refreshment. Franklin Wagner arranged things generally and Stan Skelskie handled the barbecue.

LOCAL SECTION OFFICERS

Northwest Section, No. 1

Chairman: EDWARD LIEBE, Grain Branch, USDA, 116 Federal Office Bldg., Minneapolis, Minn.
Vice Chairman: RAY ANDERSON, Central Research Lab., General Mills, 2010 East Hennepin, Minneapolis, 13, Minn.
Secretary: RALPH H. DURR, C. W. Ingman Labs., 324 4th Ave. S., Minneapolis 15, Minn.
Treasurer: SHELDON GREENBERG, The Pillsbury Co. Research Labs, 311 2nd St. S. E., Minneapolis 14, Minn.
Meeting place: Minneapolis, Minn.
Meeting date: Last Friday of each month.

Pioneer Section, No. 2

Chairman: EUGENE V. HOLM, Victor Chemical Works, 914 Board of Trade Bldg., Kansas City 5, Mo.
Vice Chairman: ROBERT HOECKER, Consolidated Flour Mills Co., Box 910, Wichita, Kansas
Secretary-Treasurer: J. B. MORGENSON, Ismert Hincke Milling Co., P. O. Box 120, No. Topeka, Kansas
Meeting place: Wichita, Kansas, and Enid, Okla.
Meeting date: Regularly in April, August, and December; Tri-state at Manhattan in October; joint meeting with Kansas City Section in February

Kansas Section, No. 3

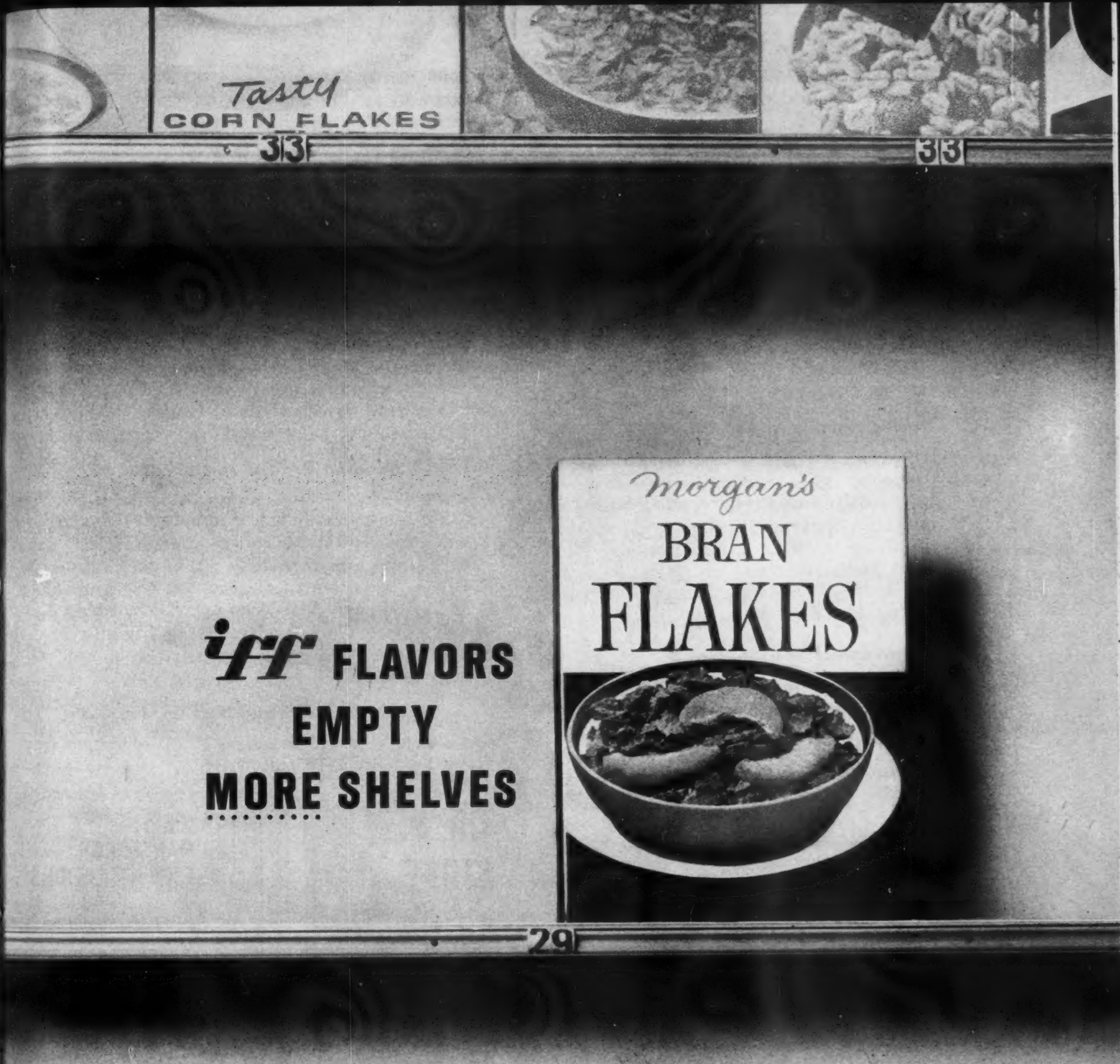
Chairman: R. T. CRAIG, Bay State Milling Co., Leavenworth, Kansas
Vice-Chairman: E. E. CHAPMAN, Doty Laboratories, 1435 Clay St., North Kansas City 16, Mo.
Secretary-Treasurer: WALTER W. COCHRAN, Wallace & Tiernan, Inc., 2800 Cherry Street, Kansas City, Mo.
Meeting place: Kansas City, Mo.
Meeting date: Second Wednesday of each month.

Nebraska Section, No. 4

Chairman: REX RUCKSDASHEL, 103 West 17th, Lexington, Nebraska
Vice-Chairman: EDGAR MEYERS, Nebraska Consolidated Mills Co., Fremont, Nebraska
Secretary-Treasurer: GIL ARON, Lincoln Grain Exchange, 505 Garfield, Lincoln, Nebraska
Meeting place: Not regular—usually meets in Lincoln.
Meeting date: Third Saturday of each month.

Central States Section, No. 5

Chairman: A. R. HANDLEMAN, Monsanto Chemical Co., 800 No. Lindbergh Blvd., St. Louis 66, Mo.
Vice-Chairman: TOM SHAUGHNESSY, Russell-Miller Mlg. Co., Alton, Ill.
Secretary-Treasurer: JOHN WATSON, Anheuser-Busch,



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Inc., 721 Pestalozzi St., St. Louis, Mo.
Meeting place: St. Louis, Mo., or Springfield, Ill.
Meeting date: Not regular.

Niagara Frontier Section, No. 6

Chairman: ROBERT VAN BUREK, Wallace & Tiernan, Inc., 975 Fuhrmann Blvd., Buffalo 3, N. Y.
Vice-Chairman: FRANK WAGNER, Feedstuffs Lab., 70 Chippewa St., Buffalo, N. Y.
Secretary: CHARLES BRONOLD, Geo. Urban Milling Co., 200 Urban Blvd., Buffalo, N. Y.
Treasurer: GERALD MRUK, Russell-Miller Milling Co., 87 Childs St., Buffalo, N. Y.
Meeting place: Buffalo, N. Y.
Meeting date: Second Monday of each month.

Pacific Northwest Section, No. 7

Chairman: DOYLE C. UDY, 2205 Orchard Drive, Pullman, Wash.
Vice-Chairman: A. J. SHOGAN, Centennial Mills Inc., P. O. Box 2159, Spokane, Wash.
Secretary-Treasurer: DONALD PITTS, Montana Flour Mills, Great Falls, Montana
Annual meeting place: Different location each year.
Annual meeting date: June 1961

Midwest Section, No. 8

Chairman: TOD J. STEWART, Schulze & Burch Biscuit Co., 1133 NW 35th St., Chicago 9, Ill.
Vice-Chairman: STANLEY A. WATSON, Corn Products Co., Chemical Div., P. O. Box 345, Argo, Ill.
Secretary-Treasurer: R. C. A. BRADSHAW, Quaker Oats Research Labs., 617 W. Main St., Barrington, Ill.
Meeting place: Chicago, Ill.
Meeting date: First Mondays, October through May.

New York Section, No. 9

Chairman: WM. J. SIMCOX, Distillation Products Industries, 190 E. Post Road, White Plains, N. Y.
Vice-Chairman: ROLAND A. MORCK, National Biscuit Co. Research Center, P. O. Box 426, Fairlawn, N. J.
Secretary-Treasurer: JOHN T. BUCKHEIT, Standard Brands, Inc., 625 Madison Ave., New York 22, N. Y.
Meeting place: New York, N. Y.
Meeting date: Second Tuesday, October through May.

Lone Star Section, No. 10

Chairman: DONALD W. HATCH, Campbell Taggart Research Corp., 3401 Haggar Drive, Dallas, Texas
Vice-Chairman: DONALD C. ABBOTT, Oklahoma State University, Dept. of Biochemistry, Stillwater, Okla.
Secretary-Treasurer: GEORGE TATE, American Foods, Inc., 8504 Chancellor Row, Dallas, Texas
Meeting place: Not regular—usually Dallas.
Meeting date: Spring, summer and fall.

Toronto Section, No. 11

Chairman: A. E. CHEADLE, Canada Packers, Ltd., 220 St. Clair Ave. W., Toronto, Ontario
Vice-Chairman: P. TEMPLIN, J. R. Short (Canada) Mills, Ltd., 70 Wicksteed Ave., Toronto, Ontario
Secretary: J. A. BUCK, General Mills (Canada) Ltd., 1500 Martin Grove Road, P. O. Box 505, Weston, Toronto 15, Ontario
Treasurer: U. OSWALD, Firmenich of Canada Ltd.,
Meeting place: Toronto
Meeting date: Third Friday of month: September to April.

Cincinnati Section, No. 12

Chairman: HARRY LOVING, Mennel Milling Co., Box 189, Fostoria, Ohio
Vice-Chairman: L. J. BRENNEIS, Harris Milling Co., Owosso, Michigan
Secretary-Treasurer: D. K. DUBOIS, Hercules Powder Co., Huron Milling Div., Harbor Beach, Mich.
Meeting place: Not regular – usually Cincinnati.
Meeting date: No fixed date. Usually held in September, January, and May.

Canadian Prairie Section, No. 14

Chairman: W. BUSHUK, Grain Research Lab., 190 Grain Exchange Bldg., Winnipeg, Manitoba
Vice-Chairman: VIC MARTENS, Grain Research Lab., 190 Grain Exchange Bldg., Winnipeg, Manitoba
Secretary-Treasurer: L. H. RENNIE, Soo Line Flour Mills, 7 Higgins Ave., Winnipeg 2, Manitoba.
Meeting place: Grain Exchange Bldg., Winnipeg.
Meeting date: Third Tuesday of each month, October to April.

Northern California Section, No. 15

Chairman: WM. J. STEPHENS, 71 Aquavista Way, San Francisco 27, Calif.

Vice-Chairman: DELMAR E. LOEWE, Albers Milling Co., 2700 7th St., Oakland, Calif.
Secretary: ROBERT FERREL, Western Utilization, 800 Buchanan St., Albany 10, Calif.
Treasurer: ROBERT WAGNER, General Mills, Inc., Vallejo, Calif.
Meeting place: Not regular.
Meeting date: First or second Wednesday of each month, October through June.

Southern California Section, No. 16

Chairman: ADA MARIE CAMPBELL, Dept. of Home Economics, Univ. of Calif., Los Angeles 24, Calif.
Vice-Chairman: BOB BURNS, Wallace & Tiernan, Inc., 424 No. Ave. 54, Los Angeles, Calif.
Secretary: JACK LAX, Joe Lowe Corp., 2744 East 11th St., Los Angeles 23, Calif.
Treasurer: JOE DEHAAN, General Mills, Inc., 4309 Fruitland Ave., Los Angeles, Calif.
Meeting place: Los Angeles

Chesapeake Section, No. 17

Chairman: EDITH A. CHRISTENSEN, Grain Division, AMS, USDA, Agr. Research Center, Beltsville, Md.
Vice-Chairman: WALTER GREENAWAY, ARS, Crops Research Division, USDA, Beltsville, Md.
Secretary: CHRIS C. HANSEN, American Stores Bakery Dept., 59th & Upland Way, Philadelphia 31, Pa.
Treasurer: MARYVEE YAKOWITZ, US Food & Drug Administration, Department of Health, Education, and Welfare, Washington 25, D. C.
Meeting place: Not regular—Baltimore and vicinity.
Meeting date: Fourth Thursday of September, November, January, April.

the President's Corner

news of the association

During my visit with my family in the Pacific Northwest, I called on a number of our mutual friends employed by milling and baking firms in Spokane, Seattle, Tacoma and the Portland area. While at Tacoma I had the excitement of wetting my line in salt water, wrangling for king salmon. Chuck Matthaei, who is well known in the association, has among his many talents a real interest in fishing and outdoor living.

Plans for the 1961 annual meeting in Dallas, Texas, April 9–14, are being firmed-up, to include the full five days. According to Hugh Petty, local arrangements chairman, a Texas-style welcome mat will be out, and there won't be a dull moment in Dallas during that week. Byron S. Miller has been working since last March on the technical program and promises to have one of the best in recent years.

Announcements regarding various sessions will be found elsewhere in this issue of CEREAL SCIENCE TODAY. Watch for other convention news items in these pages during the coming months.

Starting Thursday afternoon, April 13, and lasting through Friday, April 14, a Civil Defense Training School will be held, to provide training for food monitors in the event of an atomic attack. This school is sponsored jointly with the Department of Health, Education, and Welfare under the direction of H. J. McConnell of the Food and Drug Administration, Washington, D. C. I cannot stress too strongly the importance of this opportunity. I hope that every cereal chemist will avail himself of this opportunity to be of service in the event of an atomic attack.

Your national officers have been concerned for some time about serving local sections more effectively. Many local section members do not maintain active membership in the national Association, and thus have no direct line of communication with national officers and cannot benefit professionally from the many activities of the Association. I have recently appointed a committee consisting of local section officers to study the problem and to make recommendations to the Board of Directors. Please speak to your officers about what you feel the Association might do for you or for the benefit of your section. Perhaps thought should be devoted to providing an associate membership for those who cannot qualify for active membership. Associate members could be allowed to hold offices in local sections, and could receive CEREAL SCIENCE TODAY so as to be informed of AACC affairs and technical matters. They could register like other active members at the annual national meetings. Let me hear from you regarding local section affairs.

JOHN A. JOHNSON

ASSOCIATION COMMITTEES, 1960-1961

Association Representatives
Food Protection, W. F. Geddes; International Association of Cereal Chemists, J. A. Shellenberger

Corporate Membership
Glenn Findley, *Chairman;* Frank Hildebrand, William Ziemke, L. R. Patton, Frank Gunderson

Employment
Rowland Clark, *Chairman;* George Schiller, Claude Neill

Finance
Marjorie Howe, *Chairman;* Raymond Tarleton, D. B. Pratt, James Evans

Membership Credentials
Karl Finney, *Chairman;* Harry Obermeyer, Jeff Schlesinger, Donald Abbott

Membership Recruitment
Lyle Carmony, *Chairman;* James Evans, Howard Becker, Stewart White, Bert Morgenson

Nominating
William Ziemke, *Chairman;* Ralph Lakamp, Karl Fortmann

Thomas Burr Osborne Medal Award
Betty Sullivan, *Chairman;* A. W. Alcock, W. L. Haley, R. M. Sandstedt, Oscar Skovholt

Publication
Raymond Tarleton, *Chairman;* W. F. Geddes, Paul Ramstad, Glenn Findley, Marjorie Howe, James Pence

Publicity
Richard Hale, *Chairman;* George Swarbreck

Tellers
John Wintermantel, *Chairman;* Eugene Guy

Monograph
I. Hlynka, *Chairman;* Lawrence Aitken, W. G. Bechtel, B. M. Dirks, J. W. Pence, W. F. Geddes, J. A. Shellenberger, Majel M. MacMasters

Revision of Constitution
R. C. Sherwood, *Chairman;* J. A. Shellenberger, Clinton Brooke

Retiring President's Recognition
Clinton L. Brooke, *Chairman;* W. B. Bradley, Warren Keller

AACC TECHNICAL COMMITTEES, 1960-1961

Bran in Flour
W. L. Deatherage, *Chairman;* William R. Green, T. H. McCormack, Stanley A. McHugh, Morris Neustadt

Bread Staling
Lloyd Crossland, *Chairman;* Stuart B. Hughes, Noel Kuhrt, Karel Kulp, James W. Pence, Oscar Skovholt, Stanley T. Titcomb

Cake Flour
Harry Miller, *Chairman;* M. A. Barmore, H. H. Favor, Leo Fratzke, Harry Loving, Stanley McHugh, Jason Miller, R. S. Terrell, J. P. Woolcott

Chemical Leavening Agents
Richard Haynes, *Chairman;* D. K. Cunningham, D. C. Meek, Paul Ramstad, M. V. Trexler, J. W. Tucker

Color Measurement
Archer C. Wilcox, *Chairman;* C. L. Brooke, F. D. Schmalz, Stanley Titcomb

Cookie Flour
(Chairman to be appointed) Lester Brenneis, L. H. Fratzke, Harry Miller, Grant Pearcy, Hamilton Putnam, F. R. Schwain, Howard Simmons, Tod J. Stewart, Vincent Vogt, W. W. Prouty

Cracker Flour
Jan Micka, *Chairman;* C. L. Ardinger, R. D. Fukuda, W. H. Hanson, W. L. Heald, T. E. Hollingshead, J. S. Kelley, M. L. Lawrenson, Ray Mooi, L. S. Thompson, Jaroslav Tuzar, A. G. O. Whiteside

Definition of Terms
C. N. Frey, *Chairman;* C. L. Brooke, C. G. Harrel, C. G. Peterson, H. H. Schopmeyer

Enzyme Assay
Leland Underkofler, *Chairman;* E. J. Bass, B. Marlo Dirks, P. P. Gray, M. D. Labbee, Gerald Reed, M. J. Wolf

Experimental Milling
R. K. Bequette, *Chairman;* W. J. Eva, Norris Haslip, H. K. Heizer, F. J. McNeil, H. G. Obermeyer, L. D. Sibbitt

Fat Acidity
Robert Glass, *Chairman;* Doris Baker, Eugene J. Guy, Howard Roth, Lawrence Zeleny

Flour Particle Size
P. R. Crowley, *Chairman;* Merlin L. Anderson, R. E. Brown, J. M. Doty, Ben Grogg, Avrom Handleman, F. W. Wichser

Flour Specifications and Approved Methods
(Chairman to be appointed) W. H. Cathcart, Gaston Dalby, J. M. Doty, L. F. Marnett, W. R. Mitchell, F. D. Schmalz, Oscar Skovholt, Betty Sullivan, L. L. Warren, John S. Whinery, E. L. Von Eschen, W. H. Ziemke

Macaroni Products
L. D. Sibbitt, *Chairman;* C. C. Fifield, C. M. Hoskins, G. N. Irvine, Vincent Vogt, J. J. Winston

Microorganisms in Cereal Products
C. M. Christensen, *Chairman;* W. B. Bradley, W. H. Cathcart, Gordon Christensen, Anatole Crane, C. G. Harrel, H. H. Kaufmann, C. E. Neal, Hugh K. Parker

Mineral Analysis of Feedstuffs
E. E. Chapman, *Chairman;* C. O. Gourley

National Check Sample Service
Lester Fischer, *Chairman;* H. C. Becker, L. J. Brenneis, J. M. Doty, D. K. Dubois, Lawrence Iliff, J. B. Morgenson, L. L. Warren

Organic Acid Analysis
C. A. Watson, *Chairman;* J. Brent Adair, D. K. Cunningham, C. G. Ferrari, K. L. Fortmann, K. A. Gilles, C. B. Gustafson, Meade C. Harris, Jr., D. F. Houston, I. Hlynka, J. F. Lawrence, V. E. Munsey, G. J. Servadio, Lazare Wiseblatt

Pesticide Residues
Warren O. Edmonds, *Chairman;* E. E. Chapman, H. L. Marks, J. F. Wintermantel

Physical Testing Methods
S. J. Loska, Jr., *Chairman;* I. Hlynka, Robert Laster, Lawrence Locken, D. K. Mecham, Max Milner, W. C. Shuey

Properties of Edible Fats and Oils
D. C. Meek, *Chairman*

Proximate Analysis of Cereals
P. J. Mattern, *Chairman;* H. C. Becker, J. W. Giertz, Lawrence Iliff, G. D. Miller, C. D. Neill, J. S. Schlesinger, H. Eldon Smurr

Proximate Analysis of Feedstuffs
G. D. Miller, *Chairman;* C. S. Fudge, Eugene Kerr, J. E. MacMillan

Rate of Hydration of Powdered Milk
C. K. Sherck, *Chairman;* J. S. Barry, D. R. Coles, D. E. Downs, C. F. Obenauf, C. M. O'Malley, J. W. Tucker

Revision of CEREAL LABORATORY METHODS
Majel M. MacMasters, *Chairman;* W. G. Bechtel, K. L. Harris, O'Dean L. Kurtz, R. J. Tarleton

Today's Greatest Food Value

The U.S. Department of Agriculture* has shown that enriched bread and flour supply more nutritional value for less money than any other major food group. So display the word "Enriched" on your package. This proven way of stressing the nutritional benefits of your product will help you earn your share of the housewife's food dollar and prevent inroads by other foods.

*Report No. 6 in the Household Food Consumption Survey of 1955.

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Always specify Merck for vitamin mixtures that are light in color, easy to handle and blend uniformly in every pound of flour.

MERCK CHEMICAL DIVISION

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Sanitation Methods
O'Dean L. Kurtz, *Chairman;* R. H. Cory, J. V. Corbishley, R. B. Kilborn, P. M. Marek

Sampling of Cereal Products
M. H. Neustadt, *Chairman;* Maxwell Cooley, Lawrence Zeleny

Sedimentation
W. T. Greenaway, *Chairman;* D. C. Abbott, M. E. Armour, H. C. Becker, J. W. Giertz, John Halverson, W. L. Heald, A. J. King, J. L. Lamkin, G. W. Lenser, Edward Liebe, C. D. Neill, Paul D. Ochs, H. H. Schopmeyer, H. Elden Smurr, Martin Wise

Starch and Pentosans
W. S. Hale, *Chairman;* J. V. Corbishley, S. I. Greenberg, W. R. Meager, G. T. Peckham, Jr.

Statistics and Experimental Error
Peter James, *Chairman;* W. O. S. Meredith, J. P. Woolcott

Sugar Analysis
R. J. Dimler, *Chairman;* C. B. Broeg, K. A. Gilles, R. B. Koch, R. J. Smith

Test Baking
Henry Solle, *Chairman;* D. C. Abbott, E. C. Edelmann, Jacob Freilich, D. W. Hatch, L. D. Longshore, D. E. Meisner, S. N. Vilm, W. H. Ziemke

Vital Gluten Methods
W. A. Carlson, *Chairman;* L. H. Burt, Robert L. High, Keith Kilander, J. M. Wolf

Vitamin and Mineral Analysis
W. G. Bechtel, *Chairman;* George Hill, *Vice-Chairman;* C. Henry Allen, Jerry Chawes, D. B. Davis, E. DeRitter, Beate Feller, C. B. Gustafson, J. J. Kagan, D. L. Kinnally, R. M. Knecht, J. H. Panton, Mary Regulski

Yeast-Raised Products
D. E. Downs, *Chairman*

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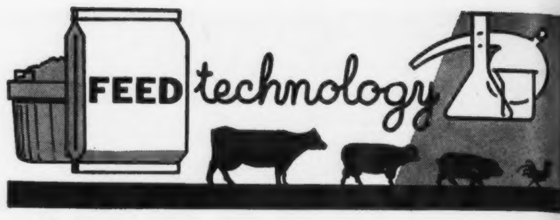
ANNUAL TRI-SECTION MEETING ANNOUNCED

Nebraska, Pioneer, and **Kansas City Sections** will hold their annual Tri-Section meeting at Kansas State University, October 7 and 8, with the Department of Flour and Feed Milling Industries serving as host. The meeting will start with a dinner, Friday evening, October 7. A luncheon is planned for Saturday at which AACC President John A. Johnson will speak.

A symposium has been planned by the Association's technical committee on particle size analysis, with Benjamin Grogg, Quaker Oats Company, as chairman. Kenneth Whitby, University of Minnesota, a recognized authority in the field, will discuss basic concepts in particle size analysis. Jasen Anis, Kansas State University, will review various sedimentation methods including centrifugation methods of analysis. R. R. Irani and Avrom Handleman of Monsanto Chemical Company will review other methods, including particle size analysis by sieving techniques. Rod Crowley, General Mills, Inc., present chairman of the AACC committee, will review studies being made by the committee on particle size analysis.

No reservations are required for this symposium, but all who plan to attend should write to the Wareham or Gillette Hotels, Manhattan, Kansas, for room accommodations.



NEWS AND ANNOUNCEMENTS

1961 Dallas Meeting. Anyone wishing to present a paper on some phase of feed technology is urged to contact, as soon as possible, your departmental editor at Chas. Pfizer & Co., Inc.,Terre Haute, Indiana. Data on assay methods or equipment, feed manufacturing operations, feed ingredients, etc., would be pertinent. For papers on nutritional aspects, please contact M. L. Cooley, Hoffman-Taff, Inc., Springfield, Missouri. Both Max Cooley and I will welcome suggestions as to topics, speakers, and program details for the two feed sessions.

1960 Feed Production School. Program details, recently announced, indicate that this year's school will be tops. If you are in production, research, or quality control, send your application in now. Each major type of grinding and milling equipment will be discussed in detail, plus a research report on hammer mill performance. Various feed mixers will also be covered, plus equipment selection for premixing, and premix preparation and handling. A fascinating new film on ingredient flow from bins will be shown. There will also be a session on FDA compliance covering storage, coding, equipment, records, and quality control associated with use of drugs in feeds. For details, contact Feed Production School, Inc., 20 West 9th St. Bldg., Kansas City, Missouri.

Sampling of Molasses. Feed chemists will be interested in a new report on this subject in the Texas Feed Service Report for June. Several inspectors sampled 15 tank truck loads by five different methods. Results of moisture and Brix tests showed very good agreement between samples. However, there was no correlation between Brix and moisture content of feeding cane molasses.

Test for TMTD in Corn. Some protectants for seed corn contain tetramethyl thiuram disulfide (TMTD), which is toxic for poultry. Occasionally, small amounts of this treated corn may find their way into feed channels. Professor Arthur A. Camp of the Gonzales, Texas, Substation has outlined an inexpensive qualitative test which feed manufacturers may use to detect treated grain. Shake 10–15 g. of grain in 25 ml. of chloroform for 3 minutes. Filter through cotton. Add a few crystals of cupric chloride and shake another 2–3 minutes. If TMTD is present, a characteristic amber-brown color will appear in the chloroform. The method may also be applied to mixed feeds.

Feed Microscopy. A major event at the recent Feed Microscopists' meetings was the release of copies of the new revised manual on "Microscopic Analysis of Feeding Stuffs." Consisting of 200 pages in looseleaf binder, this manual covers microscopic characteristics of virtually every major feed ingredient and trace additive. Also included are sections on

equipment, test methods, quantitative estimation, and photomicrography. Copies can be obtained at $7.50 each from the Association Secretary, Mr. G. M. Barnhart, c/o Missouri Department of Agriculture, Jefferson City, Missouri.

New FDA Bulletin. FDA Technical Bulletin No. 1 entitled "Microscopic Analytical Methods in Food and Drug Control" was released recently. The booklet, 9 by 12 inches, contains 250 pages with numerous excellent illustrations. Subjects covered include sources and types of contaminants; isolation and detection of contaminants; microscopy equipment; spoilage fungi; insect data; rodent filth; histology; and chemical microscopy. This is an excellent compilation and an ideal companion volume to the Feed Microscopy Manual. Copies are available at $2.00 each from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

ROBERT C. WORNICK

··· INTERNATIONAL REPORTS ···

• • • Australia

THE BREAD RESEARCH INSTITUTE OF AUSTRALIA

In 1947, the bread manufacturers of New South Wales formed and financed an institute which was to serve the industry as an advisory and applied research body. It soon grew in membership and today is supported by more than 2,000 bakers and millers in all Australian States, in New Zealand, and in Asia. Since 1951, further support in the form of research grants has been received from the Commonwealth Council and Scientific Research Organization (CSIRO) and, since 1957, also from the Wheat Industry Research Council.

This growth has led to the building of new laboratories on land made available by the CSIRO at North Ryde, Sydney. The official opening in May was by the Hon. D. A. Cameron, O. B. E., M. P., Minister for Health and Minister-in-charge of the CSIRO, and was attended by a representative gathering, among whom probably the best-known in the cereal field was D. W. Kent-Jones from England.

The services of the Institute's laboratories, scientists, baking instructor, and test bakers are available to all members of the Institute and its affiliated organizations. The Institute handles the day-to-day problems of the baking industry, carries out routine analyses for quality control programs, investigates latest overseas developments in relation to Australian conditions, and carries out applied technological research and a long-term program of basic physicochemical and biochemical studies into wheat and flour quality.

The building was designed not only to provide laboratories for analytical work, test and pilot-scale bakeries, and research laboratories for individual programs, but also to be flexible enough to allow for growth and redistribution of research activities. This flexibility has been achieved by planning to a three-foot module, by providing column-free floor space for laboratories, and using light-weight partitioning.

The main wing contains the administrative section consisting of the general office, smaller offices, library, conference room, and reception and enquiry area; laboratories for routine analyses, test bakery and research laboratories. A smaller wing, right-angled to the main wing, contains a well-equipped amenities block, pilot-scale bakery, research laboratories, chromatography room, photographic dark room, and cold storage room.

The physical testing laboratory adjacent to the milling room is equipped for carrying out tests on the properties of dough and for testing yeasts. The analytical laboratory, which has its own balance room, a room to house the Kjeldahl apparatus, reagent store room, and a separate office can carry out chemical tests on flour, bread, meals, bread improvers, and shortenings. Adjacent to the chemical laboratory is a fully equipped test bakery where 100-g. loaves are made up and examined.

A pilot-scale commercial bakery equipped with a standard flour sifter, a dough mixer (capacity 150 lb. flour), a cold-water unit with an automatic tempering tank, a temperature-controlled fermentation cabinet, a final proving cabinet with temperature and humidity control, a double-deck, two-tray, rotary-type oven for small batches, a fifteen swing tray oven capable of baking two hundred two-pound units per hour, a 9-kilowatt and a 30-kilowatt steam generator, and a molder designed by the BRI for experimental work will enable the institute to simulate conditions found in commercial bakeries when carrying out experiments designed to overcome difficulties which have been encountered in bakeries.

The baking technology laboratory contains specially designed scale-model equipment for carrying out work on continuous mixing, a mixer, oven, and noodle-making machine on which tests are being carried out with Australian flour.

Research laboratories have been designed to house small teams of research workers or individual scientists, and the flexible design of the building allows for redistribution of space as required. Besides containing standard research equipment, the laboratories contain specially designed equipment which was built in the Institute's workshop. Ancillary service rooms are shared by research workers.

Careful planning and use of modern functional material have provided the Institute with a building of 14,000 sq. ft., which is outstanding for the attractive working conditions it provides for the staff of 35. Use of mosaic parquet flooring throughout the building and a harmonizing color scheme give a sense of unity despite the varied activities. Large windows with wide overhanging eaves give glare-free natural lighting and make the most of the natural beauty of the site.

The Institute is under the direction of E. E. Bond, who has been in charge of its activities since its inception.

R. A. BOTTOMLEY

BOOK reviews

Insect and Rodent Control, Departments of the Air Force, Army, and Navy, Feb. 1956, 182 pp. Order PB 161357 from Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C.; price $3.00.

A comprehensive manual now released to industry, summarizing in a single volume the worldwide experience in insect and rodent control of the Armed Forces. The manual describes the characteristics and habits of 85 insects, rodents, and other pests. Chemical and mechanical control measures are specified for each species, and effective poison doses are tabulated, with complete instructions for mixing, spraying, and spreading. Necessary human health precautions are listed. In some cases, preventive measures are emphasized rather than extermination; e.g., the use of natural insect enemies. Control techniques discussed include fumigation, screening, trapping, treatment of wood and concrete, and systematic inspection. The manual also includes more than 100 drawings and photos, five pages of tables and pest control formulas, a bibliography, and a list of 60 training films.

■ ■ ■ ■

Introduction to Colloid Chemistry, by Karol J. Mysels. Interscience Publishers, Inc., New York, 1959. vi + 475 pp. Price $10.00. Reviewed by D. R. BRIGGS, University of Minnesota, St. Paul 1, Minn.

As stated in its preface, this book is "written with two audiences in mind; first, the student who may use it as a text book in a short introductory course, and second, the industrial chemist or executive who desires a coherent and concise survey of a field neglected in his academic career."

Treatment of the subject is almost meticulously restricted to the particulate and structural properties of colloidal systems. Surface chemistry, an equally important facet of colloid chemistry, is not included. The author opens the discussion with a description of some of the structural elements of particulate colloid systems and their behavior under the influence of only gravitational and Van der Waal forces. This is followed by a consideration of the effects of thermal agitation alone on such systems and, then, of those effects that are a combination of all of these factors. Next, electrical forces which may exist in such systems, together with their effects thereon, are discussed at length, first alone and then in relation to those forces previously considered. Finally, optical properties and effects, refraction, interference, and scattering, are brought into the picture.

Development of the subject matter is accomplished in a lucid and logical manner, readily understandable to a reader who may not be specifically acquainted in the field. Details which might tend to obscure the simplicity of presentation or confuse the clear development of fundamental relationships are avoided, while the basic concepts and theories of colloidal behavior are effectively presented. The reader, in either category toward which the treatment is aimed, will find this discussion of the properties of particulate colloid systems both interesting and rewarding in the concepts it will introduce and in the applications it will suggest.

Problems are included as a means by which the reader can test the accuracy of his understanding of the concepts that have been introduced in each chapter. A well-defined set of symbols, used consistently throughout the book, avoids confusion from this source. Adequate references are given for the convenience of the reader who may wish to pursue the subject matter in greater detail.

■ ■ ■ ■

Conditioning and Drying of Cereal Grains (Getreidekonditionierung, Getreidetrocknung), by Werner Schafer and Ludwig Altrogge. Published by Moritz Schafer, Detmold, Germany, 1960; 381 pp. Price 42 Dutch marks. Reviewed by R. GRACZA, The Pillsbury Co., Minneapolis, Minn.

The full title of this book, "Science and practice for conditioning cereal grains, with an introduction into the fundamentals of grain drying," assesses the content more specifically than does the shortened title given above. Organization of the subject matter into 15 sections with short chapters and tables gives the impression of a handbook with its many detailed items of information, comprising 170 figures and 120 tables. With its summarizing manner, the book is a first of its kind.

Principles, different methods of wheat conditioning and drying, a large array of laboratory tests and results, different laboratory equipment, and processing machinery are comprehensively described and cautiously evaluated, with discussion of both advantages and disadvantages of the different systems. The evaluation uses mainly technological terms such as heat, temperature, time, moisture content, extraction rates, ash, and baking qualities, to name only the most important ones. Extra sections deal with heat supply in wheat-processing plants, economic calculations and controls of conditioning, and related engineering tables.

The 425 references are used in a fashion which complements the author's evaluation, in offering further study to the reader at points where he wishes to delve into up-to-date details of the subject matter. The relatively short subject index offers some help to the reader; however, the lack of a page index for the 16 pages of literature references appears to be a minor shortcoming.